

EL DORADO AGRICULTURAL COUNCIL

DAVID L. JONES
2006

GROWING GRAPES IN EL DORADO...
THE MAGIC OF THE MOUNTAINS



GROWING WINE GRAPES IN EL DORADO COUNTY

INTRODUCTION

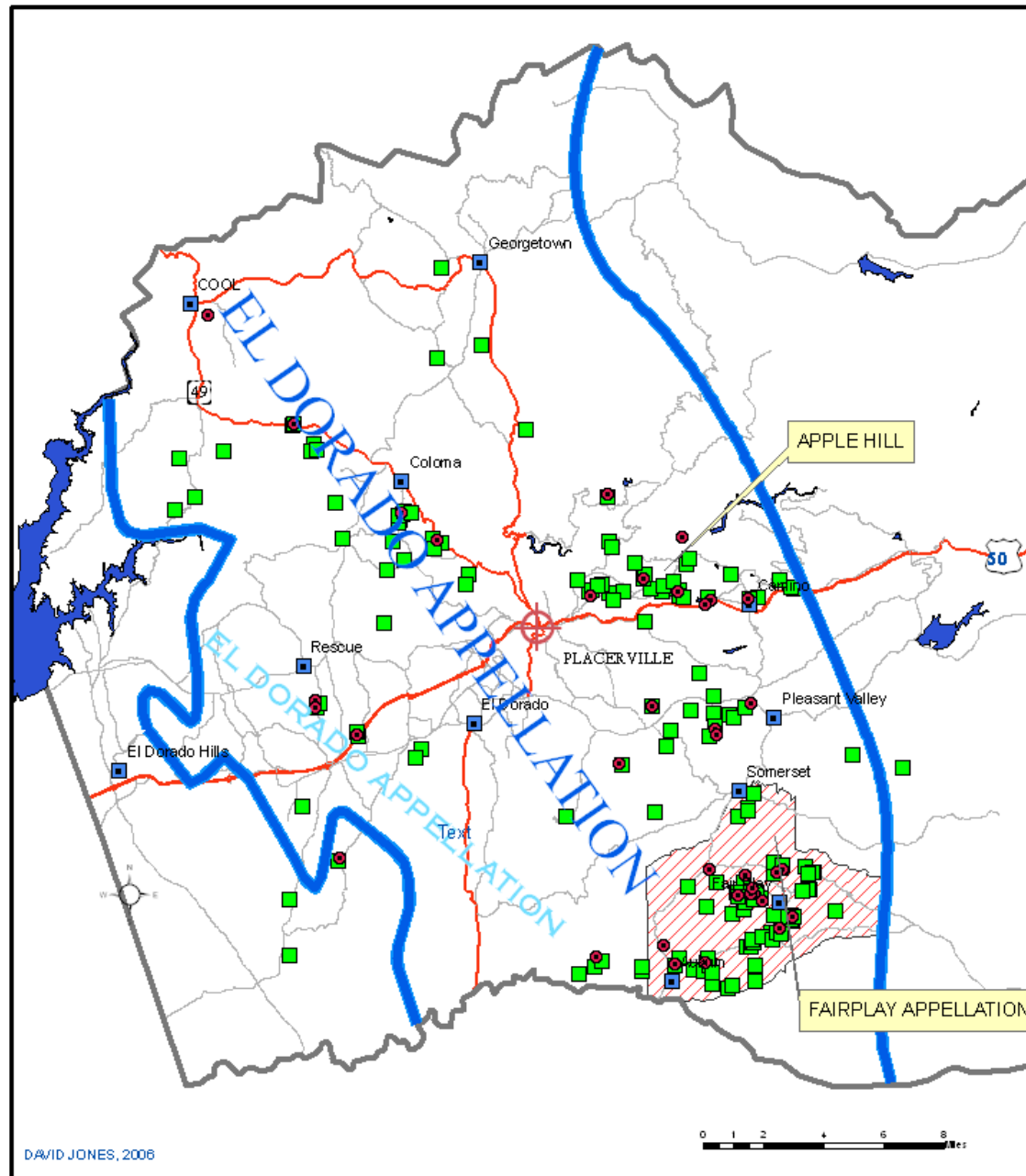
It is a well-known fact that from region to region wine varies in character and quality. The factors that determine why grapes exhibit such a wide range in flavor and quality are elusive and still poorly understood, but it is generally agreed that soils and climate both play essential roles. In past years the role of climate was deemed paramount by many California vintners, but now the critical role of soils is more widely appreciated, as it has been in France for centuries. These two features -climate and soils- working together produce what viticulturists call *terroir* - a French term signifying a summation of all the subtle climatic and soils attributes that impart to wine from a particular vineyard or region a special character found nowhere else. Terroir connotes a sense of place, and grapes from El Dorado, perhaps more strongly than elsewhere in California, express fully this concept. In this section, we explore some of the physical reasons why El Dorado is such a special place for growing grapes and producing fine wines.

The growing importance of *terroir* can be seen in the widespread use of geographic designations, or Appellations, that denote specific growing regions ("Napa Valley" is the best known Appellation in California. "El Dorado" is also an appellation, (see figure 1) but it has only recently been identified as producing wine of special character. All such geographic terms must be registered with and approved by the U.S. Department of Agriculture). Another rapidly growing usage that signifies *terroir* is the designation on the label of the specific vineyard in which all the grapes were grown. The term "Estate Bottled" on a wine label carries a similar connotation in that all the grapes in that particular bottling were produced by, or under the direction of, the winery that produced the wine. Some appellations are so large (e.g., "California") that the concept of *terroir* becomes meaningless. That is not to say that such wines blended from grapes grown in several different areas are inferior wines - they do, however, generally lack the unique characteristics that identify the wine's homeland. The trend in California wine production during the past ten years or so has been to more clearly differentiate and promote these various growing regions and this trend is likely to intensify as each region attempts to gain recognition of their own special characteristics.

. Three separate appellations can be applied to EL Dorado Grapes (see figure 1): Sierra foothills; 2) El Dorado; and 3) Fairplay. Sierra foothills is appropriate for wine blended from grapes grown in two or more foothills appellations (e.g., Amador and El Dorado). For all appellations, 95% of the grapes processed to make a particular wine must have been grown within the designated area..

All El Dorado vineyards are in a mountain setting at elevations high above the valley and coastal fog belts. The mountainous topography imparts complexity and variety to our growing conditions that are not found in valley settings. Three critical aspects - high elevation, complex topographic, and lack of fog, make El Dorado appellation unique and impart a special character to our grapes. No other grape growing region in North America possesses this special set of physical parameters, which is why El Dorado wines are rapidly gaining recognition in world-wide markets.

EL DORADO AND FAIRPLAY APPELLATIONS IN EL DORADO COUNTY



Legend

- ed appellation
- Wineries
- Vineyards
- fairplay appell

Figure 1 . Map of western El Dorado County showing location of El Dorado and Fairplay appellations. Generalized location of vineyards (green) and wineries (red) show a strong concentration in the eastern portion of the El Dorado appellation at elevations between 2,000 and 3,000 feet.

CLIMATE and WEATHER

"Climate" is a term that refers to the long-term temperature, humidity, and rainfall characteristics of a region. "Weather" signifies the short-term, daily, weekly, or yearly variations that typify any climatic region. Climate changes slowly, whereas weather is changeable from day to day. For the grape grower, understanding both the long-term and short-term conditions is vital. The long-term climatic conditions stipulate whether or not growing grapes is feasible, and if so, which kind of grapes may be grown successfully. Critical climatic data include: average maximum and minimum temperatures during the growing season; average rainfall and yearly rainfall distribution; average relative humidity, and average date of the last killing frost in the spring. The longer duration of weather data that is available, the more meaningful these kinds of measurements may be. Short term, daily to monthly weather data is useful for proper crop management, for spraying programs, and for efficient irrigation schedules. Freezing weather following bud break (early to mid April) is a local hazard that can severely damage young shoots and drastically decrease grape production in affected vineyards. A frost warning system and overhead sprinklers or a misting system may ameliorate this problem under favorable conditions.

Daily weather conditions are modulated by topography. Air changes density as it is warmed or cooled, so that warm air rises and cold air sinks and flows over the topography much like water. During freezing weather, cold air will flow downhill from regions of higher elevation and may pond in valleys or depressions if the natural drainage way is blocked, resulting in a thick blanket of frosty air that can freeze the entire grape vine. Good air drainage is essential for avoiding frost problems. In general, ridges tend to be cooler than valleys during the day, and warmer during the night. For this reason, hill sides are preferred sites for planting grapes because they exhibit more dynamic microclimates. South and west-facing slopes are warmer than east and north-facing slopes, so these differences must be taken into account for proper positioning of selected grape varieties

Climate Zones:

Various methods have been proposed to categorize and compare the climatic conditions within and between various regions. The two most widely used are **native plant communities**, and **degree-day heat summations**. Neither method tells us all we would like to know about the climate, but both are useful. Degree-day summations are easiest to understand as they are based on physical measurements (temperature), but as they utilize only average daily temperature measurements during the growing season (April 1 through October 31), the maximum and minimum peak values as well as winter-time values are not considered. Plant communities, on the other hand, record the response of flora to the entire spectrum of climatic conditions throughout the year, but the climatic conditions during the growing period may not be uniquely specified.

Native Plant Communities: Three climatic zones defined by plant communities have been identified as being suitable for wine grape growing in El Dorado County. These are roughly delimited by elevation, as follows:

- Region II - Elevation ranges from 2,200 to 3,200 feet; Black oak and Madrona are the best indicator trees. Other diagnostic species include: Douglas fir, Ponderosa pine, and Incense Cedar.
- Region III - Elevation ranges from 1,200 to 2,200 feet; Live oak, Grey ("Digger") pine, Pon-

derosa pine, Toyon, and poison oak thrive in this environment.

- Region IV - Elevation ranges from 800 to 1,200 feet; Blue oak is the best indicator species accompanied by Live oak, Grey pine, and brushy species (chaparral).

The purported link between this zonation and elevation must be treated cautiously, because variation in soil character as well as topography can modify local plant communities. Special plant communities that lack temperature (or elevation) control exist on soils derived from weathered gabbro and serpentinite (rocks rich in magnesium and iron); likewise, thin, rocky volcanic soils on ridge tops above 2,200 feet may support plant communities characteristic of much lower elevations. In addition, cool and damp north-facing slopes have markedly different vegetation than do warm and dry south-facing slopes. Region II is the preferred zone for planting grapes as it is more amenable to wider range of grape varieties.

Degree-day heat summations: The concept of characterizing grape growing regions by degree-day heat summations was applied in California by Professors Winkler and Amerine of the Department of Enology and Viticulture at U. C. Davis. Their method consists of summing the average daily temperature over 50° F during the growing season. Five climatic zones or regions were defined, as follows:

- Region I: less than 2,500 degree days
- Region II: 2,500 to 3,000 degree days
- Region III: 3,000 to 3,500 degree days
- Region IV: 3,500 to 4,000 degree days
- Region V: over 4,000 degree days

It is now generally agreed that Region III is optimum for most varieties of red wine, including Cabernet sauvignon, Merlot, Zinfandel, Syrah, and Petite Sirah; excellent wine is also produced in some areas of Region IV, including Cabernet sauvignon, Barbera, Zinfandel, and Sangiovesi. Only Pinot noir seems to do well in Region II. For white wines, excellent White Riesling, Gewürztraminer, and Chardonnay are produced in Regions II and III, and excellent Sauvignon blanc is grown in many areas of Region III and even Region IV.

El Dorado lies mainly in Region III, and is most similar in heat summation to the famous Oakville district of Napa Valley (see fig. - for average degree day heat summations for well-known growing regions of California). The average El Dorado degree day summation for the past 6 years is 3238; for Oakville, 3237. Saint Helena (north of Oakville in Napa Valley) is much hotter than El Dorado, with a 6-year average of 3672 (Region IV). Local variation within the complex topography of El Dorado, however, can lead to dramatic differences in degree day summations even within a single vineyard. One carefully documented vineyard in Apple Hill at an elevation of 2,900 exhibits a range from 2,600 degree days (Region II) to 3,600 degree days (Region IV). Under such extremely variable conditions, detailed weather data are essential for proper placement of suitable grape varieties.

The range of variation in degree day heat summation throughout the fruit-growing region of El Dorado County is not yet well documented because of a paucity of temperature recorders. The best data now available is provided by the CIMIS recorder in Camino at an elevation of 2770' and the CIMIS recorder in the Shenandoah Valley of Amador county at an elevation of 1560'. Amador averages about 170 degree days/yr higher than Camino, but the average daily maximum temperatures in Amador are significantly higher and the average minimum temperatures there are lower. The lower minimum temperatures of Amador are a function of topography - the El Dorado CIMIS recorder is situated on top of a ridge, whereas the Amador recorder is in a low part of the Shenandoah Valley close to Indian Creek. This difference fortifies the observation that ridges tend to be warmer at night than near-by valleys. Some cooler

valley sites in El Dorado have heat summations that are nearly 1,000 degree-days lower than Amador, or comparable to the Carneros district of Napa and Sonoma.

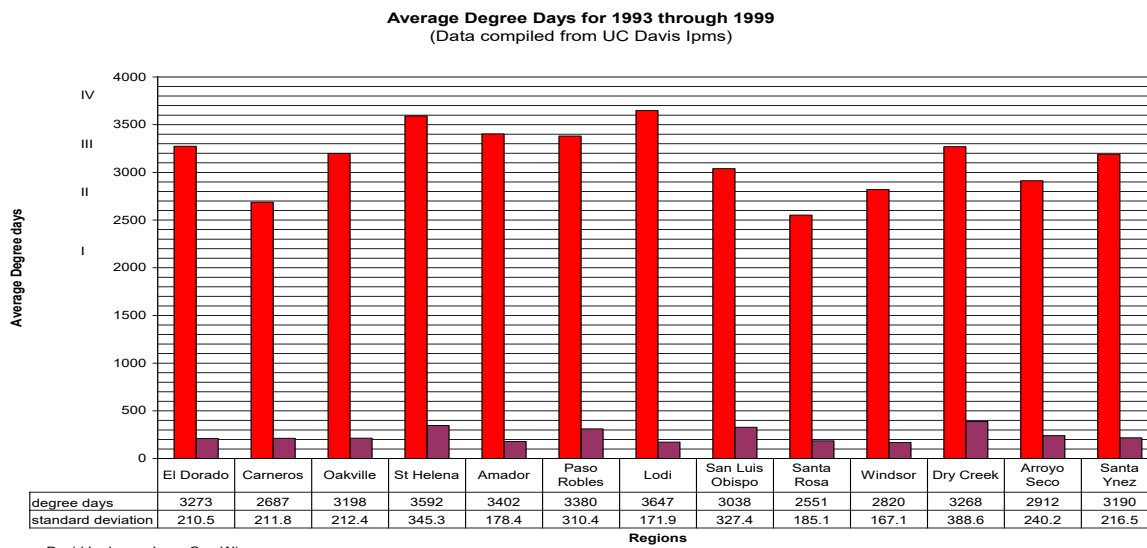


Figure 2 Comparison of average degree-day heat summations in the major grape growing regions of California. Note the El Dorado has about the same temperature regime as Oakville in Napa Valley. On the other hand, Oakville, in Napa Valley, shows conversably higher maximum temperatures than does El Dorado (fig 3a)

Shown here (fig. 3) is the annual cumulate heat summation from the CIMIS weather station located at the Camino Nursery of the US Forest Service. This graph shows that EL Dorado mainly is a zone III growing region, which is ideal for most red and white grape varieties. Since 1993, only 2 years were warmer, 2001 and 2003.

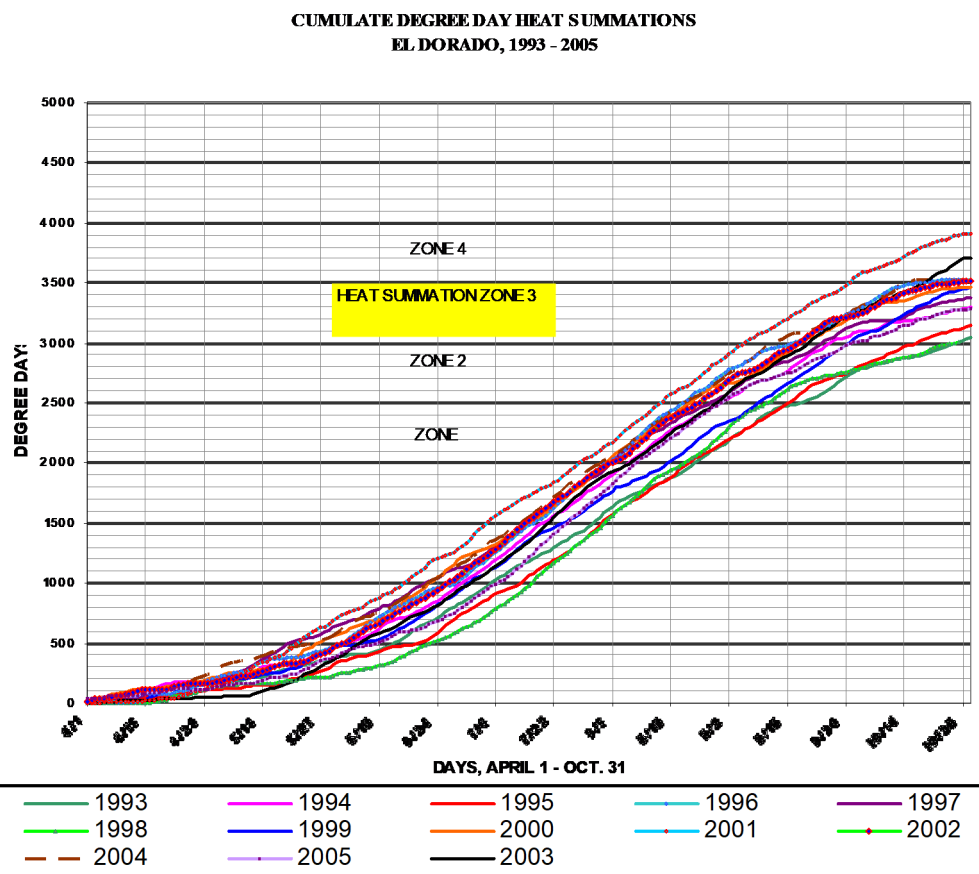


Figure 3. Cumulate annual degree day values for the Camino CIMIS weather station. El Dorado typically falls within degree day zone 3, which is ideal for most red wines. Occasionally, (2 times in then past 10 years,) region 4 values have been obtained.

MAX DAILY TEMPATURE OF OAKVILLE COMPARED TO EL DORADO, 2006

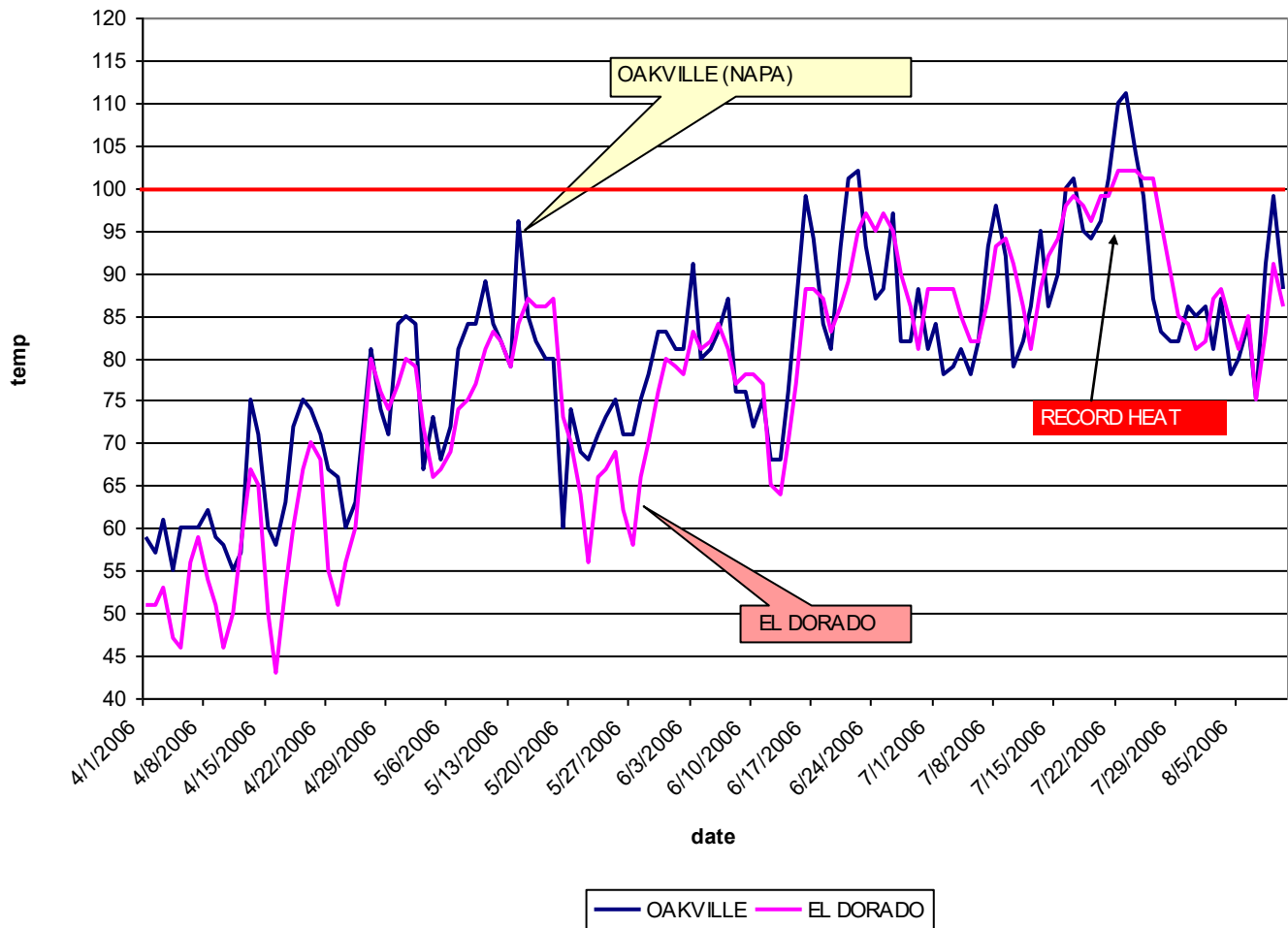


Figure 3a. Comparison of daily maximum temperatures of Oakville in Napa Valley with those of El Dorado (Camino CIMIS station). Note that Oakville had much higher temperatures during the record year wave during the latter part of July, 2006.

Frosts and Freezes

Spring frosts are a significant hazard to grapevines in El Dorado County. Bud break generally occurs in early April, but killing frosts (with temperatures below 28° F) are not uncommon during the last week of April and into early May. Young plants that are not trained up a stake are most vulnerable because the coldest air lies close to the ground surface, but mature plants also can suffer major crop damage. Crop losses of up to 50% have occurred in some vineyards within the past 10 years. Overhead sprinklers and misting systems may afford some protect to mature vines, but these methods may be ineffective at temperatures below about 28°. Vineyards situated on ridge tops near major rivers or canyons tend to have fewer frost problems than do those located in valleys, where cold air may pond to form a very deep layer of freezing air. Valleys with good air drainage may be relatively frost-free. Late pruning is a useful technique where spring frosts are common. Pruning early budding varieties such as chardonnay in early April may delay bud-break for several weeks, and thus avoid having the new shoots damaged by frost. Autumn frosts have not been a problem in El Dorado, even though cool-year harvests may extend beyond mid-

November.

Winter-kill of vines may occur if the minimum temperature drops below 0° F for an extended period. This has not been a problem in El Dorado in regions below 3,500' in elevation, but low temperatures certainly prohibit commercial vineyards at elevations above this level.

Rainfall

Average rainfall (~40" at Placerville) is sufficient to replenish soil moisture. Most rainfall occurs between October and April with showers continuing into May. Occasional summer thunderstorms may occur in July and August, and hail storms in May and June can damage vines and other fruit crops. Commencement of the winter rainy season varies from early October to mid-December or later; early rains before harvest can promote bunch rot and drop in sugar content due to water intake by the vines. Dry farming of grapes is possible with average rainfall conditions, provided that a minimum soil-depth of 4 to 5 feet prevails throughout the planted area. Dry farming during periods of low rainfall can lead to serious loss of crop and even mortality of the vines.

SOILS

Classification of soils is complicated and the terminology used by soil scientists is arcane and generally poorly understood by farmers. Primary attributes of soils that are important to growers include, among others: mineral composition, soil texture, soil thickness, depth of root penetration, water retention properties, and resistance to erosion. Much of this information may be extracted from the Soil Survey of El Dorado County published by the U.S. Department of Agriculture, Soil Conservation Service. An easy and simple way to judge the suitability of a particular soil or property is to examine the nature of the natural plant communities that are presently growing there. Soils that support a healthy stand of pine trees will surely support grape vines or other fruit trees; soils that support only low shrubs and stunted trees (mainly Grey pine) may lack essential nutrients, and thus may not be suitable for commercial vineyards.

Almost all soils in El Dorado are sandy to clay loams that formed in place by weathering of the underlying bedrock. In contrast to these residual soils, large valleys such as the Sacramento Valley or Napa Valley have soils that are composed of mineral grains and rock fragments that were transported from the surrounding hillsides and deposited as alluvium by streams and rivers. Residual soils have characteristics inherited directly from their underlying geologic parent (bedrock), whereas alluvial soils represent a mixture of many different parental sources and are not related to the underlying bedrock. A simplified residual soil map of western El Dorado County is shown on figure 4. The principal types of rock and the more important residual soils derived from them, are listed in the following table, along with the major soil series that characteristically occur on each bedrock type. The bulk of the vineyards in El Dorado are planted in young volcanic, granitic, and slate soils. A lesser number are planted in soils derived from old volcanic rocks (greenstone), and the serpentine and gabbro soils have been mostly avoided. Other soil characteristics that are important include: depth of soil (3 feet being about the minimum needed to support vines without excessive watering); mineral composition and organic content; water retention properties (a function of porosity and permeability); resistance to erosion; electrical conductivity (a measure of salt content); and soil texture. Deep, well-watered fertile soils are not the best for vineyards as the high fertility tends to promote excessive canopy growth at the expense of fruit production.



SIGNIFICANT BEDROCK UNITS AND RESIDUAL SOILS OF WESTERN EDC

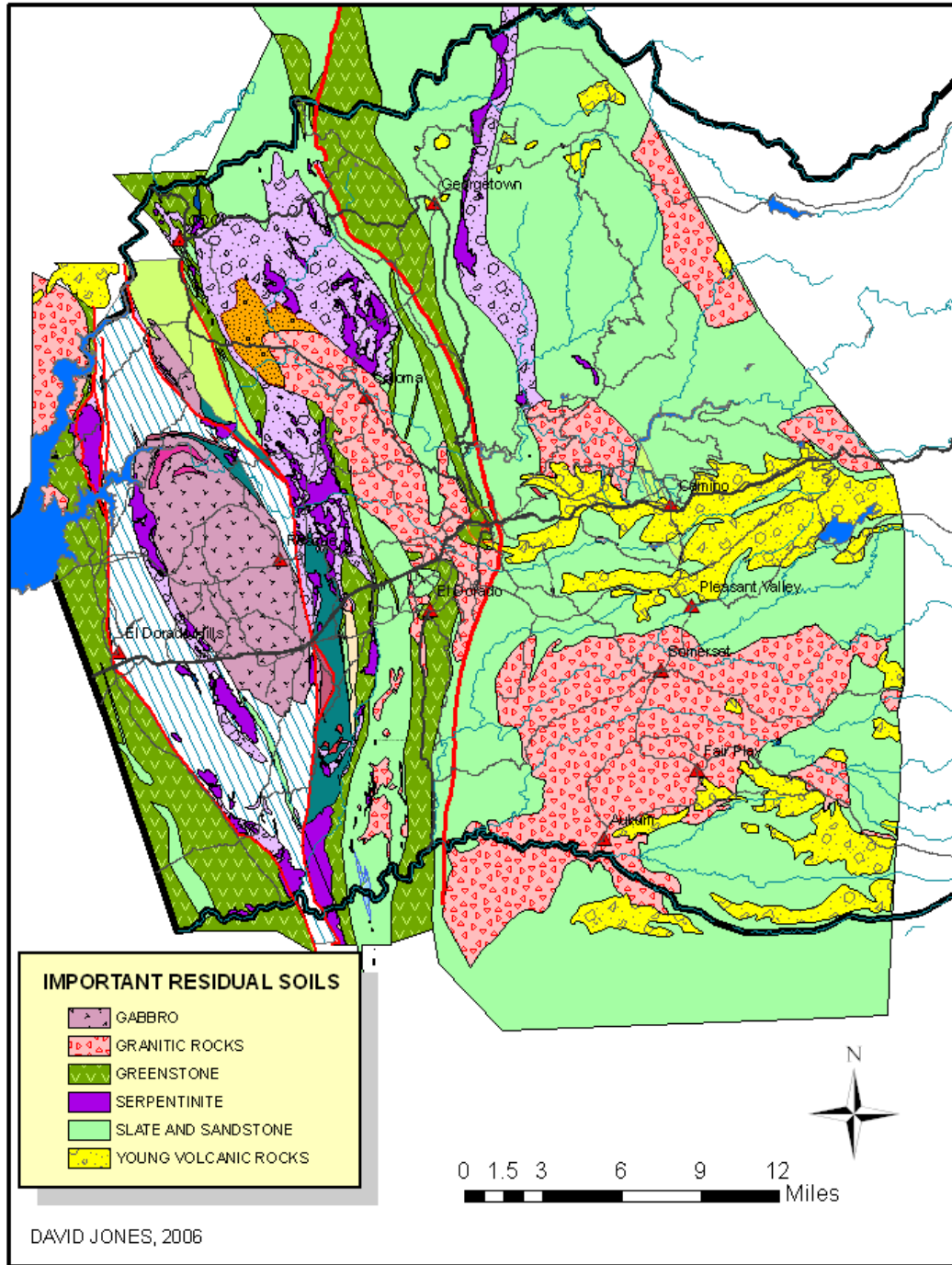


Figure 4. Geologic map of western El Dorado County showing bedrock geologic units and residual soils derived from weathering of the underlying rocks. Granitic, young volcanic, and slate soils are the types most widely used for planting grapes.

PARENT ROCK	MAJOR SOIL SERIES	VINEYARD SUITABILITY
Young volcanics	Aiken, Cohasset, McCarthy	Excellent if 3' + thick; ridges may be rocky and thin
Granitic rocks	Auberry, Ahwahnee, Sierra	Good to excellent; easily eroded and nutrient-poor
Slate & sandstone	Mariposa, Josephine, Sites	Good to excellent; avoid clay-rich or thin soils
Old volcanic rocks	Auburn, Argonaut, Boomer	Suitable if 3'+ thick; may be rocky and thin on ridges
Serpentine & gabbro	Serpentine, Rescue & Delpiedra	Unsuitable to marginal; thin soils that lack nutrients

All the soil types listed above (except serpentine and gabbro) may produce grapes of excellent quality. Whether or not varietal quality varies with soil type is yet to be determined, although one may surmise that the different soils will have some critical influence on grape flavors.

Topography

El Dorado County forms a gently sloping ramp that connects the flat Central Valley (near sea level) with the high, rugged crest of the Sierra Nevada at elevations over 8,000 feet. That part of the ramp lying between 1,200 and 3,000 is most suitable for agricultural activities, including grape growing as lower elevations lack suitable soils and higher elevations are subject to killer frosts in the spring. Westerly flowing streams and rivers have excised deep canyons into this slope which act as conduits for air drainage and so have a dramatic affect on the temperature of surrounding areas.

Soil characteristics and farming practices vary with the topography. Ridge tops tend to have thin soils if rates of erosion exceed rates of soil formation through weathering processes. Soils particles are displaced from ridge tops and move down slope into hollows on the hillside where they may accumulate to depths of many feet. These thick hillside accumulations of soil are ideal places for grapevines, but they also may be easily eroded or become unstable during prolonged periods of rainfall. Land sliding and destructive erosion in vineyards is locally a major problem in the Northern Coast Ranges, but so far, El Dorado has avoided significant damage due to these processes. Farming practices that are useful on hillsides include: not planting hillsides with slopes that exceed 20%; maintaining median grass sod strips between the rows that are mowed, not disked; contouring vines along the hillside; avoid planting berms that tend to channelize water flow.

Varietal placement within the vineyard also must consider the climatic effects of slope. North-facing slopes are cooler, retain more soil moisture, and receive less sunlight than do south facing slopes. Valleys are more frost-prone than ridge tops. Temperature gradients are more extreme where air drainage is concentrated. All these factors will influence how grapes respond to their local microclimates and will ultimately determine which localities produce grapes of outstanding quality (which, of course, demand the highest price in the marketplace!).

WATER

Adequate water supplies are mandatory for establishing and maintaining healthy grape vines. Dry farming is feasible under optimum conditions, but in drought years young plants may die and established plants maybe overstressed and fail to produce an adequate crop. Irrigated vineyards are better able to withstand the vicissitudes of weather variation and allow normal crop production in dry years. Rough estimates of irrigation water usage in vineyards in Apple Hill at elevations of 2,500' to 2,600' suggest that ~150 to 200 gallons per vine applied throughout the growing season is a nominal requirement under average weather conditions; for vineyards planted to 600 vines per acre, this translates total usage of ~0.3 to .5 acre-feet of water/acre. In contrast, pear and apple orchards in the same region require ~2-3 acre-feet of water/ acre to produce commercial crops.

Commercial water is available from the El Dorado Irrigation District in the Placerville-Gold Hill regions, and from the Georgetown Irrigation District on the Georgetown Divide. EID is the largest supplier, with about 5,000 acre feet available for agricultural uses stemming from both South Fork American River sources and from Sly Park Reservoir. The bulk of this agricultural water is utilized in Apple Hill and in Gold Hill. This water system relies solely on gravity flow, and is able to deliver water to farm sites at remarkable low cost. The southern part of the county (Fairplay) lacks commercial agricultural water and is dependant of ponds, springs, and wells for both domestic and irrigation needs. During most years these sources seem adequate for present needs of limited scope, but prolonged drought could cause economic hardship and loss of crops. Large-scale developments there seem to be precluded without an adequate and assured water supply.

GRAPE VARIETIES

El Dorado County is unique in California in that more different varieties of wine grapes are grown here than in any other single appellation. As shown in the list below, at least 37 varieties are grown and processed locally for wine. These varieties include most of the Bordeaux, the major Rhone, the two principal Burgundian varieties, and many Italian and Spanish grapes. Diversity is the theme song of El Dorado! Planted acres as of 2002 of each variety are plotted in fig.5 Our mountainous topography provides an abundance of microclimates in which nearly every grape variety of commercial interest can find a comfortable home. This diversity gives El Dorado appellation an appeal to wine tasters that may be missing elsewhere—the wines of the world may be sampled during a one-day trip to EL Dorado County!



LIST OF GRAPE VINES GROWN IN EL DORADO COUNTY

AGLIANICO	GRENACHE	RIESLING
ALVARELHÃO	MALBEC	ROUSSANNE
BARBERA	MALVASIA BIANCA	SANGIOVESE
CABERNET FRANC	MERLOT	SAUVIGNON BLANC
CAB. SAUVIGNON	MOURVEDRE	SEMILLON
CARIGANE	MUSCAT CANELLI	SOUSÃO
CHARBONO	ORANGE MUSCAT	SYRAH
CHARDONNAY	NEBBIOLO	TEMPRANILLO
CINSAULT	PETITE VERDOT	TINTA CÃO
DOLCETTO	PINOT GRIS	TOURIGA NATIONAL
FLORA	PINOT NOIR	VIIGNIER
GEWURZTRAMINER	PRIMITIVO	
GRACIANO	REFOSCO	

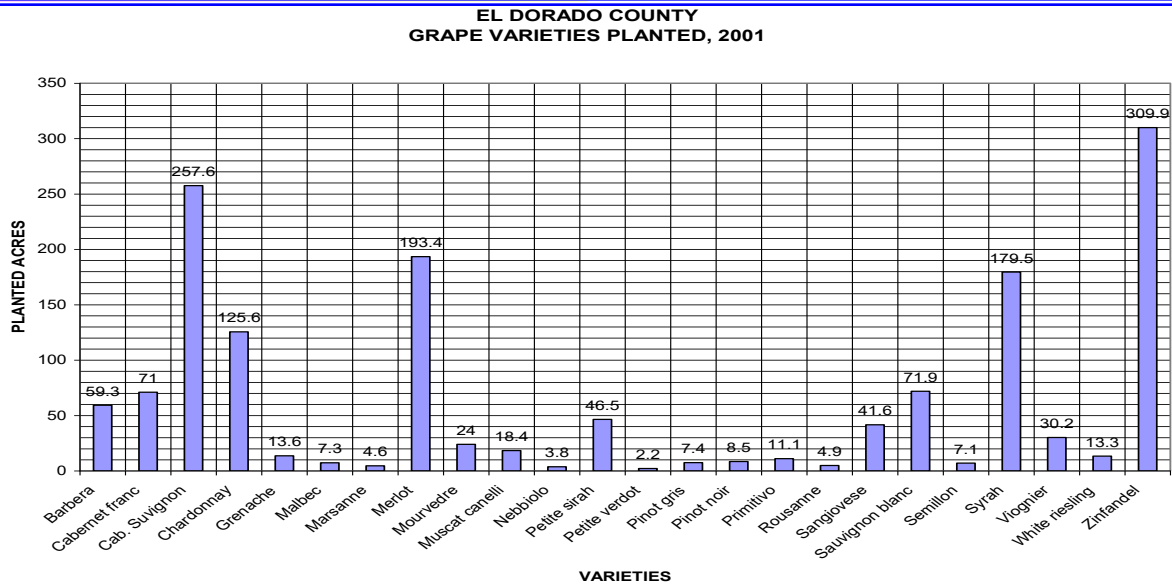


Figure 5 Planted acreage of wine grape varieties in El Dorado County, 2002.

This plethora of grape varieties that grow well in El Dorado, however, poses a dilemma for the prospective vineyard developer. ***What to plant?*** This question is asked more than any other and is difficult to answer for not only must site characteristics be evaluated but also market trends, demand for grapes, and grape prices. These latter factors change rapidly and dramatically – rarely does one make all the perfect choices. The best advice may be to talk to the wineries and ascertain which varieties are selling at good prices and which grapes are showing strong market demand, and then make sure that the varieties you choose fit the site.

Agricultural districts:

Farming activities in El Dorado are mainly conducted in 7 agricultural districts that were established over 15 years ago to protect and enhance farming operations. These districts provide the following important advantages to the farmers, as well as to all of the citizens of the County:

1. Zoning stability with 20 acre minimum lot size
2. “Right to farm” ordinance that prohibits nuisance complaints by adjoining property owners for legitimate farming activities
3. Protection for our choice soils
4. Reduction in urbanization pressure
5. Protection of our rural environment
6. Wildlife and natural habitat protection
7. “Best management practices” to insure environmental protection
8. Market identification and focus through direct ranch marketing ordinances

Since they were originally established, improvements in digital data sets now allow reassessment of all the lands within and without these districts. Preliminary analysis shows that large tracts of land now outside the districts have characteristics similar to those within the districts (e.g., choice soils, 20 acre or larger lot size, slopes less than 50%, and elevation less than 3,000”) and are good candidates for inclusion in new or expanded districts (see figure 1). We estimate that 30,000 acres or more of lands with choice soils may be available for incorporation into the ag district system. Studies are now underway to identify

and field check potential areas for inclusion, as well as to deselect small areas that may no longer be suitable for inclusion.

Agricultural economic centers:

The basic concept underlying the agricultural economic centers is that high-quality farm and winery products sold on-site will attract affluent buyers. The high quality of our local agricultural products, coupled with incomparable mountain scenery, abundant recreational opportunities, and the presence of historical sites of national significance create an unparalleled combination that no other region in California can offer. A key element for success, however, requires development of a tourist-related infrastructure that affords the type and style of amenities that ag- tourists have come to expect from visits to other parts of California. Necessary facilities include:

FARMS, VINEYARDS, FARM PRODUCT SALES AND PROCESSING FACILITIES
 RESTAURANTS, STORES, INNS, B&BS, FARM HOMES, DESTINATION HOTELS
 VISITORS' INTERPRETIVE CENTERS, FORESTRY AND FARM SCIENTIFIC CENTERS (e.g.,
 BLODGETT FOREST, INSTITUTE OF FOREST GENETICS, AND THE USFS PLACERVILLE
 NURSERY), AG TRAILS, NATURE CENTERS
 ADEQUATE ROADS AND PARKING FACILITIES
 ASSURED POTABLE WATER SUPPLY
 FIRE AND PUBLIC SAFETY SYSTEMS
 INFORMATIONAL ROAD SIGNAGE AND TOURIST KIOSKS
 HISTORICAL DISPLAYS AND INFORMATION

These disparate facilities need not be duplicated in every regional center. Indeed, it is highly desirable that each center capitalizes on its own strengths and merits and develops a unique style and suite of facilities.

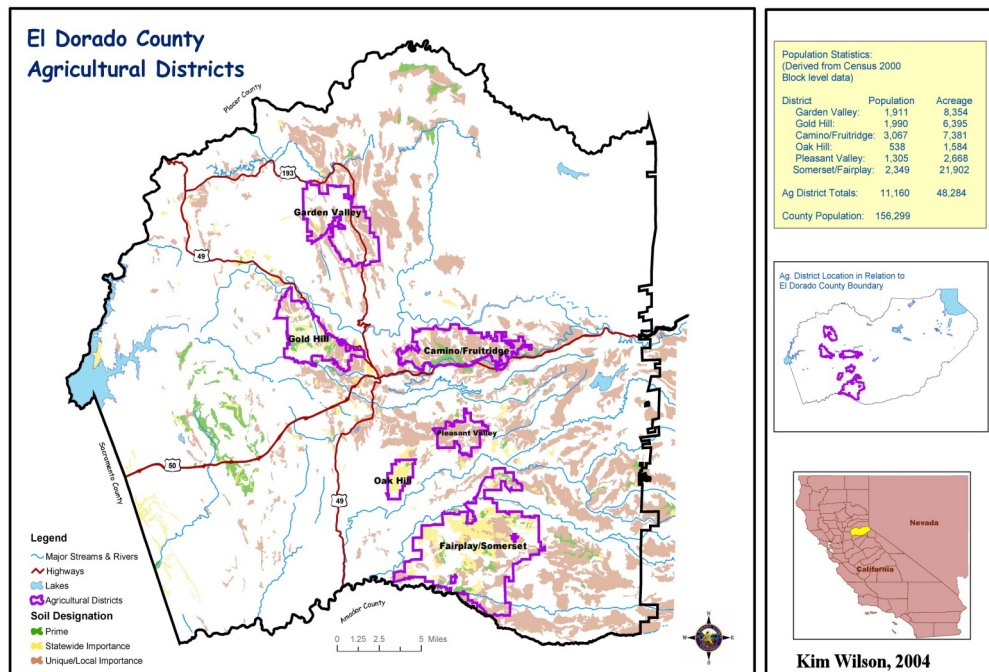


Figure 6. Agricultural districts in EL Dorado County. Most farming activities are concentrated within these districts and their activities are protected and enhanced by county regulations.

SO WHY IS EL DORADO SUCH A SPECIAL PLACE FOR GROWING GRAPES AND MAKING WINE?

A unique combination of geographic, geologic, and climatologic attributes have come together in El Dorado to create a special place for growing wine grapes. No other place in California is comparable! Every popular variety can find a niche here and will produce great wine.

El Dorado is cooled by elevation, not by fog as is the coastal region, meaning that our grapes receive more sunshine and so become fully ripened without developing excess herbaceous or high acidity that is out of balance with the fruit flavors. Likewise, our relatively cool temperatures allow the grapes a long “hang time” so that they ripen uniformly without developing prune-like flavors found in very hot regions. Our soils are thin and lack a permanent water table so stressing the vines for quality control after veraison is rarely required. Excess canopy growth due to abundant ground water is not a persistent problem as it is in valley settings with a high water table. Because of low humidity, grape diseases such as powdery mildew are not such pernicious problems as they are in moister regions. And finally, our diverse soils offer a panoply of geologic and geographic settings that assure maximum favors will be concentrated within the grapes. **The test is in the tasting—El Dorado wines are diverse, rich, elegant, true to varietal character, well-balanced with full-bodied fruit flavors, mild tannins, and well-developed aromas. Come and try them—they are unique!**



LIST OF FIGURES

1. Map of western El Dorado County showing location of appellations, vineyards, and wineries.
2. Average degree-day heat summations for selected important grape-growing regions of California.
3. Annual degree-day heat summations for El Dorado, 1993 through 1999
- 3a. Comparison of max temps, Oakville and El Dorado
4. Residual soils and location of vineyards in El Dorado
5. Graph of grapes grown in El Dorado
6. Ag districts in El Dorado County

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

- *BILL STEPHANS, AG COMMISSIONER, EDC*
- *BILL FROST, UC EXTENSION SERVICE, EDC AG ADVISOR*
- *DONNA HERSHFELD, GRAPE SPECIALIST, UC EXTENSION SERVICE*
- *DAVID JONES, LAVA CAP WINERY*
- *EL DORADO WINERY ASSOCIATION*
- *EL DORADO GRAPE GROWERS*
- *EL DORADO CHAMBER OF COMMERCE*