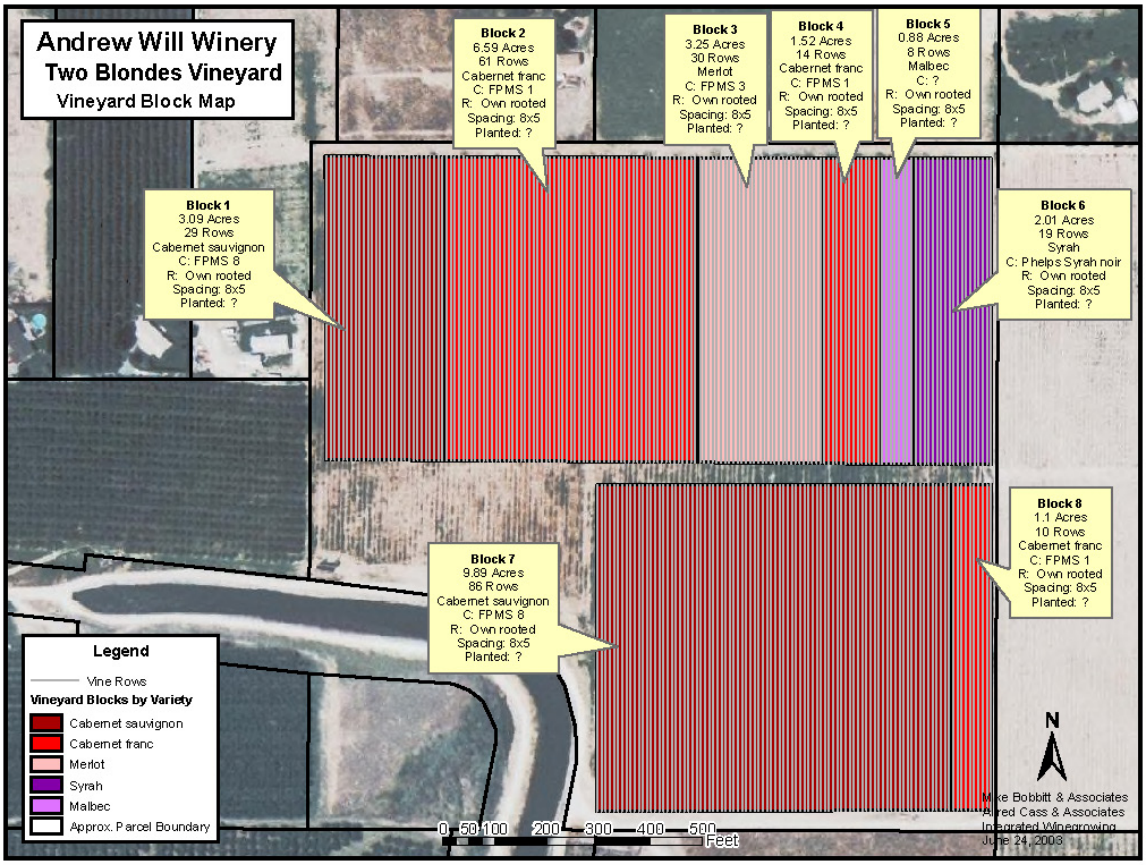
2006 Weather Summary for Two Blondes Vineyard



Prepared by:
Mark Greenspan, Ph.D.
Advanced Viticulture, LLC

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Introduction

This is a weather and climate summary for Two Blondes Vineyard based on measurements made during the 2006 growing season, with comparisons made to the 2005 season. This report is not a climate survey and does not purport to represent climatic characteristics of the vineyard sites. A climate report requires many years of data while this weather summary uses only the weather data that is available from the automated temperature data loggers that have been installed in the vineyards.

There are two Hobo weather stations at Two Blondes Vineyard, one located at a higher elevation and the other at a lower elevation. Comparisons between the two locations will be made, when differences are apparent. The top station was used as the reference when comparing 2006 to 2005.

I. Temperature and Heat Summation

Two Blondes had 3253 degree days in 2006 compared to only 3182 degree days in 2005 (Figure 1). July was the warmest month in 2006. Like 2005, the months of April and October were quite cool, indicative of the short, intense growing season at this location (and in the region). The upper station had about 200 more degree days than the lower station (Figure 2). Degree days were higher at the top station for each month, though the differences were largest from July through September. The differences between the two locations were primarily due to lower nighttime temperatures, though daytime temperatures were also a bit cooler (to be discussed).

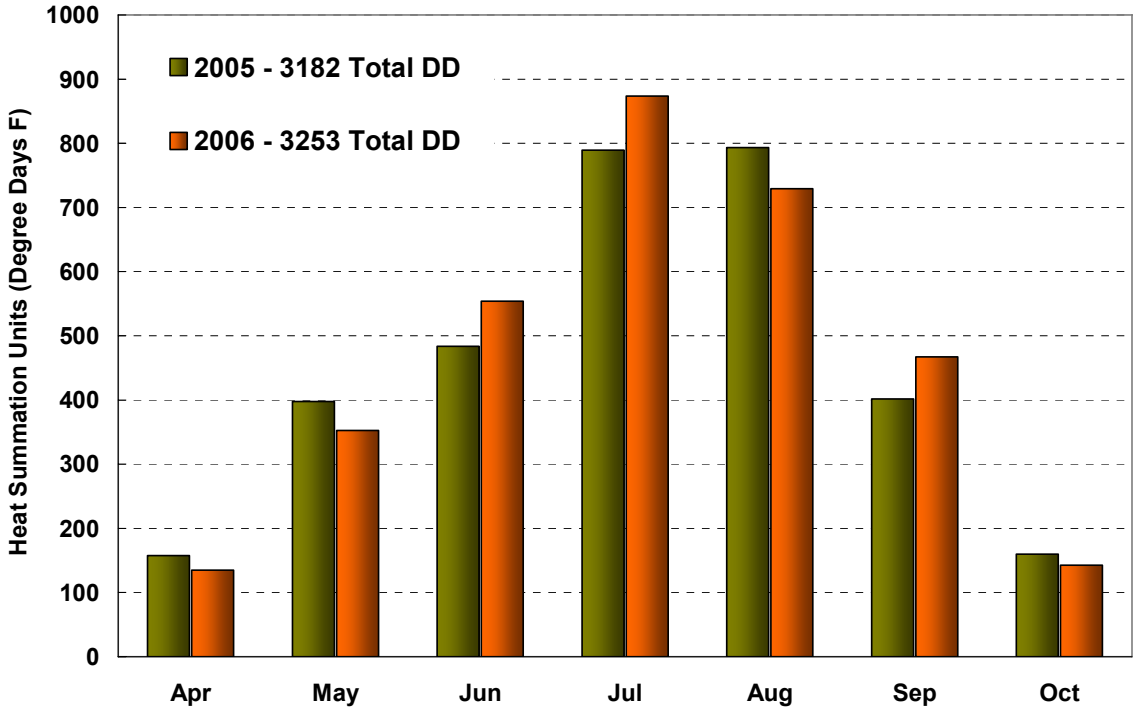

Figure 1: Monthly heat summations for the top station at Two Blondes Vineyard for the 2005 and 2006 growing seasons. 50°F was used as the baseline temperature.

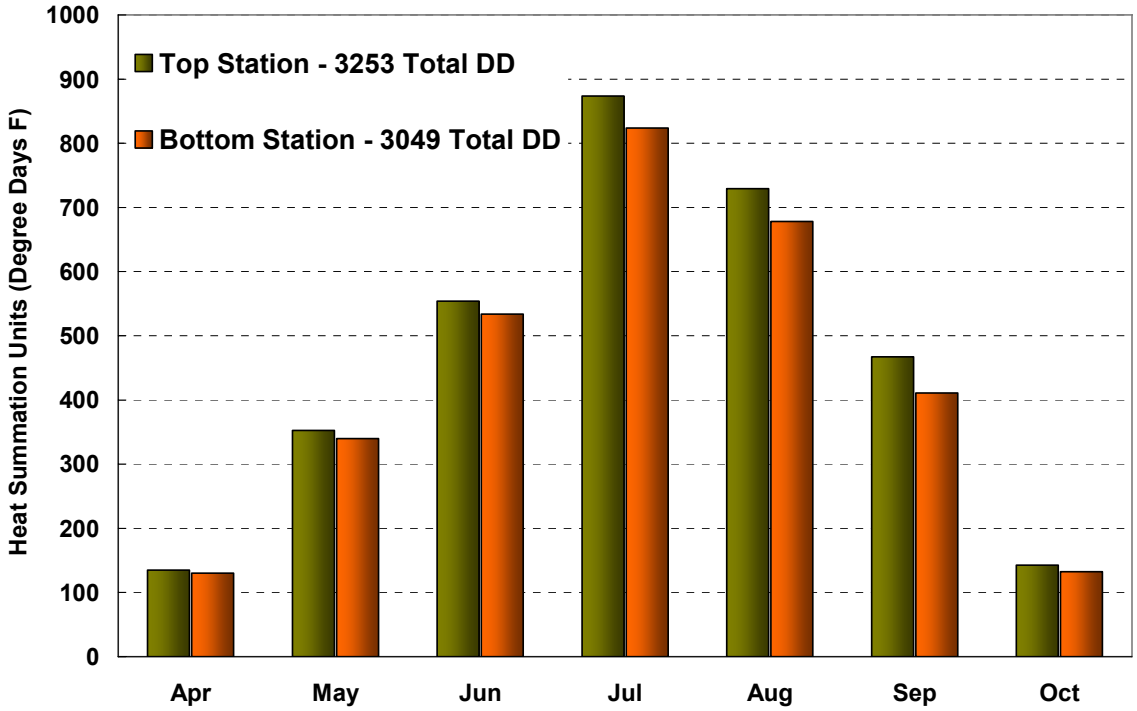

Figure 2: 2006 monthly heat summations for two locations at Two Blondes Vineyard. 50°F was used as the baseline temperature.

Average daily maximum temperatures were higher in 2006 than in 2005 during the months of June, July and September (Figure 3). Maximum temperatures were slightly cooler during August and much cooler during the month of March. The top station produced consistently higher maximum temperatures than the lower station (Figure 4), though the temperature differences were not large between the two locations. Furthermore, the differences were not apparent during March through May and in October.

Generally, the heat extremes are not very high at this locations, though the month of July seems to have pushed into quite warm temperature territory.

Average daily minimum temperatures were not consistently higher or lower between the two recorded years (Figure 5). The biggest differences were in the months of March and October, where 2006 temperatures were about 3 degrees cooler. The bottom station had consistently colder temperatures than the top station (Figure 6), with temperature differences between 2 and 3°F. Colder nighttime temperatures are to be expected at lower elevations within a given location, due to settling of the colder air during the stable night conditions.

The night temperatures are quite cold during early spring and during Fall. Night temperatures during mid-summer are quite mild, and even a bit warm. The warm nights during a portion of the season will aid in fruit development, since fruit metabolism is generally independent of photosynthesis, and is highly temperature dependent. However, if fruit has not matured by the month of September, further ripening will be impeded by both cool daytime and nighttime temperatures.

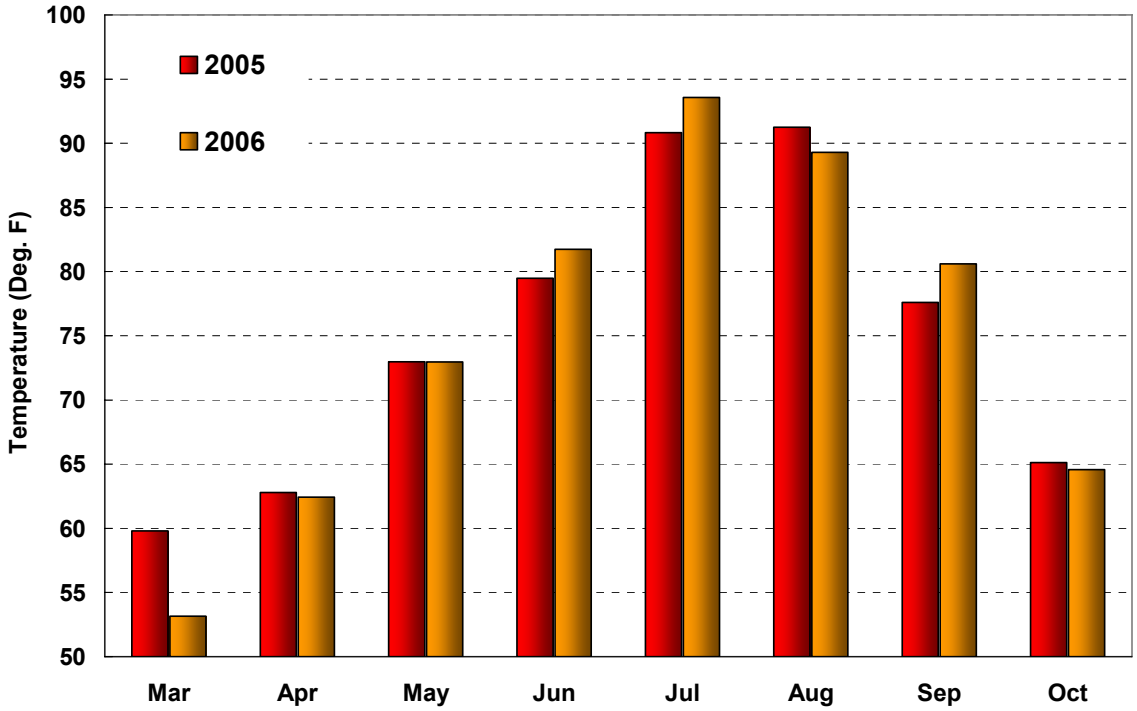

Figure 3: Monthly averages of daily maximum temperature for the top station at Two Blondes Vineyard for the 2005 and 2006 growing seasons.

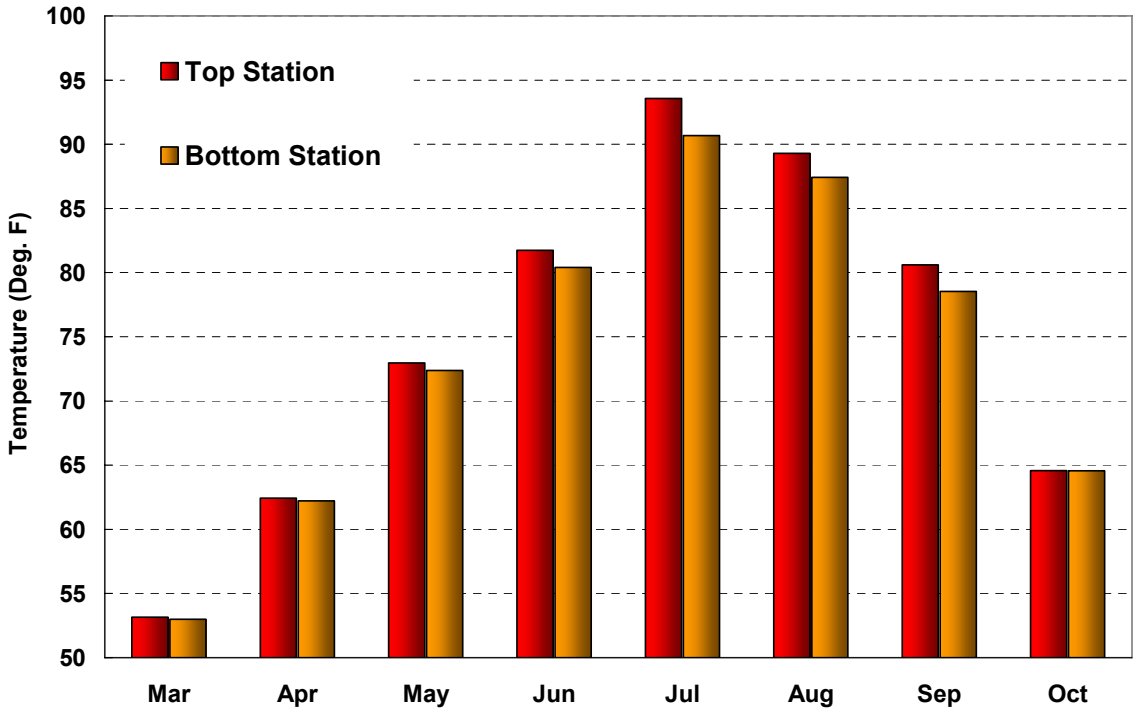

Figure 4: 2006 monthly averages of daily maximum temperatures for two locations at Two Blondes Vineyard.

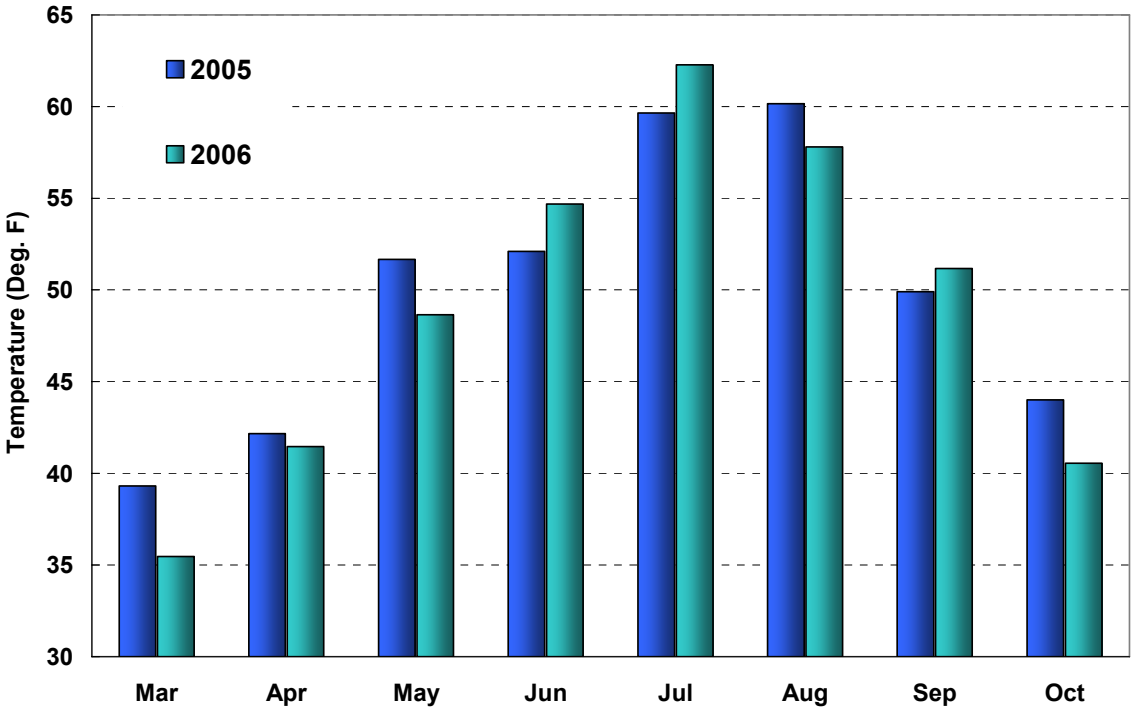

Figure 5: Monthly averages of daily minimum temperature for the top station at Two Blondes Vineyard for the 2005 and 2006 growing seasons.

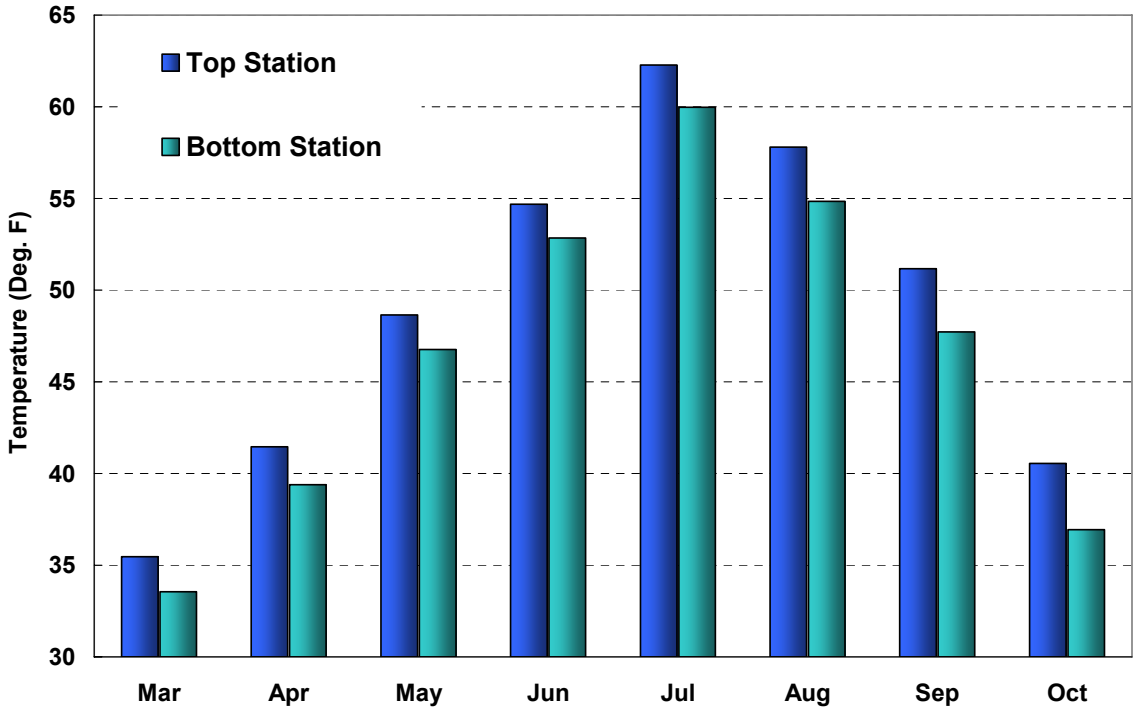

Figure 6: 2006 monthly averages of daily minimum temperatures for two locations at Two Blondes Vineyard.

II. Ripening Period Analysis

A general period of ripening was chosen for analysis, which comprises mid-August through mid-October. This period was chosen as a standard to capture the ripening periods of multiple regions and grape varieties. The average daily minimum, maximum and mean during the ripening period are shown in Figure 7 for 2005 and 2006. Clearly, temperature minima, maxima and averages were very similar between the two years, although the maximum temperatures were about 2 degrees warmer in 2006 during the ripening period. As was found with all months of the year, temperatures at the top station had higher temperature maxima and higher temperature minima during the ripening period (Figure 8).

The average diurnal temperatures during the ripening period are a very illustrative way of looking at the temperature characteristics during this critical period. Comparing diurnal temperatures in 2006 to 2005 (Figure 9), the night temperatures were nearly identical between the two years. On the other hand, the daytime temperatures were warmer in 2006, and the temperature difference of 2-3°F persisted from morning through evening.

Comparing the diurnal temperature curves between the top and bottom locations (Figure 10), it is clear to see that the top station experienced warmer temperatures during both the daytime and nighttime. The temperatures during the nighttime are critical for fruit maturation. Temperatures need to stay above 50°F for berry metabolism to continue. Generally speaking, warmer night temperatures will allow fruit to reach “flavor maturity” at lower sugar content. The upper location best epitomizes the warmer night characteristic.

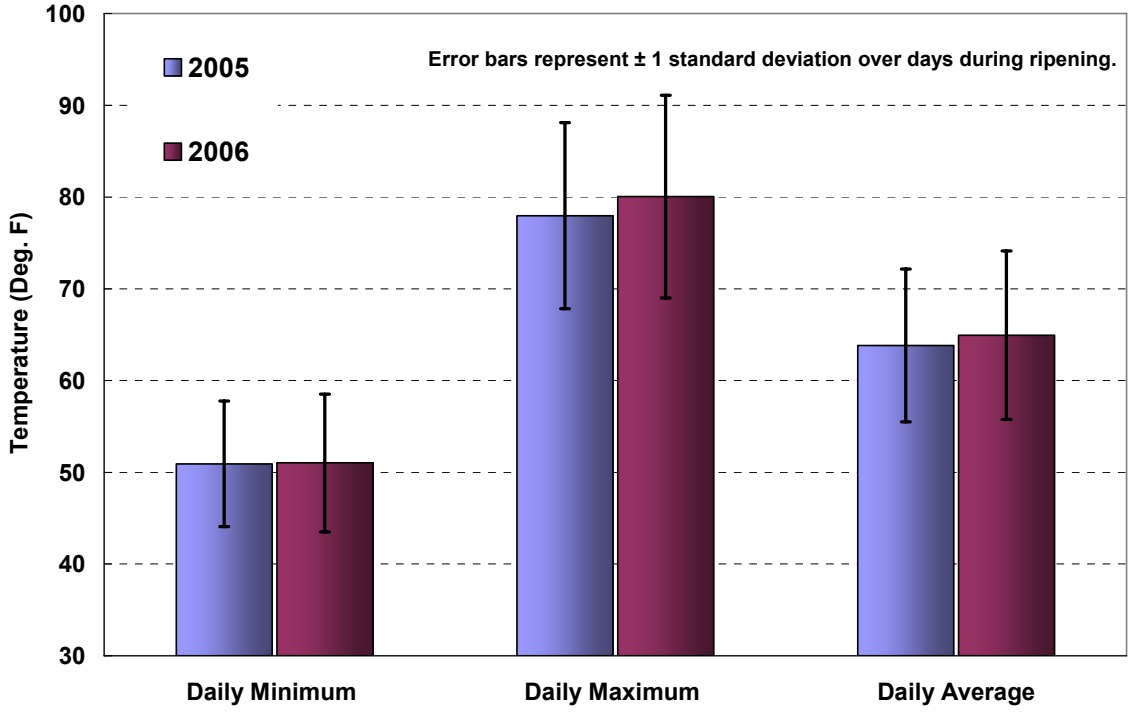

Figure 7: Average daily minimum, maximum and average temperature during the 2005 and 2006 ripening periods.

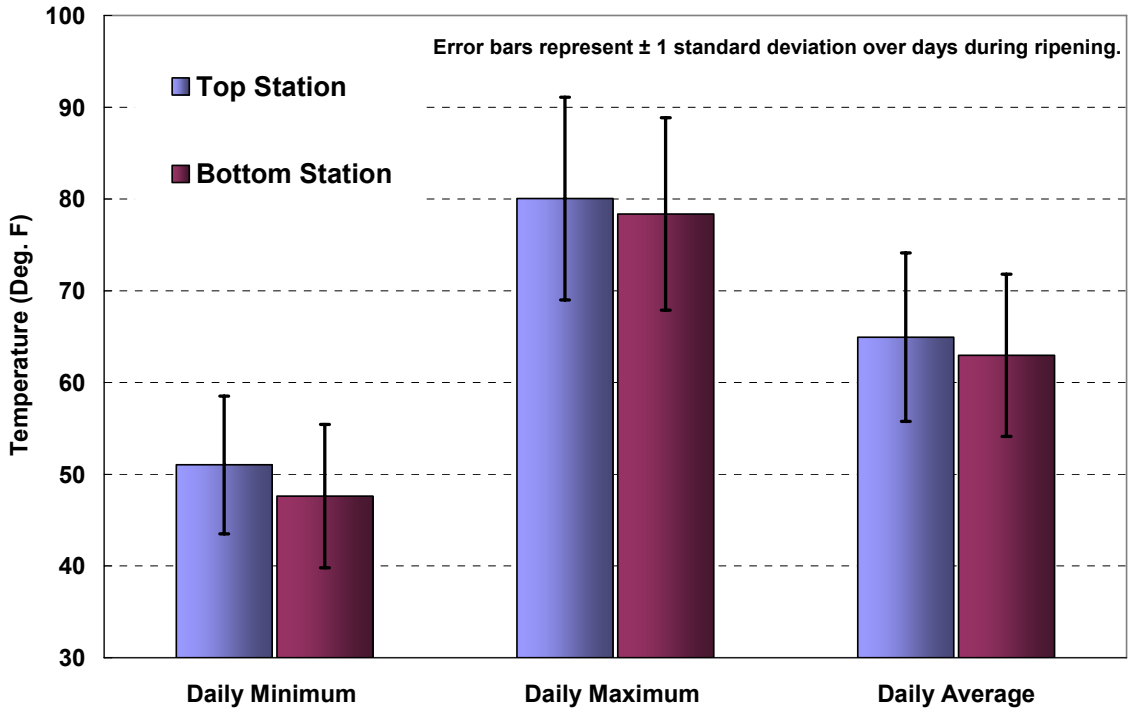

Figure 8: Average daily minimum, maximum and average temperature during the 2006 ripening period for two stations at Two Blondes Vineyard.

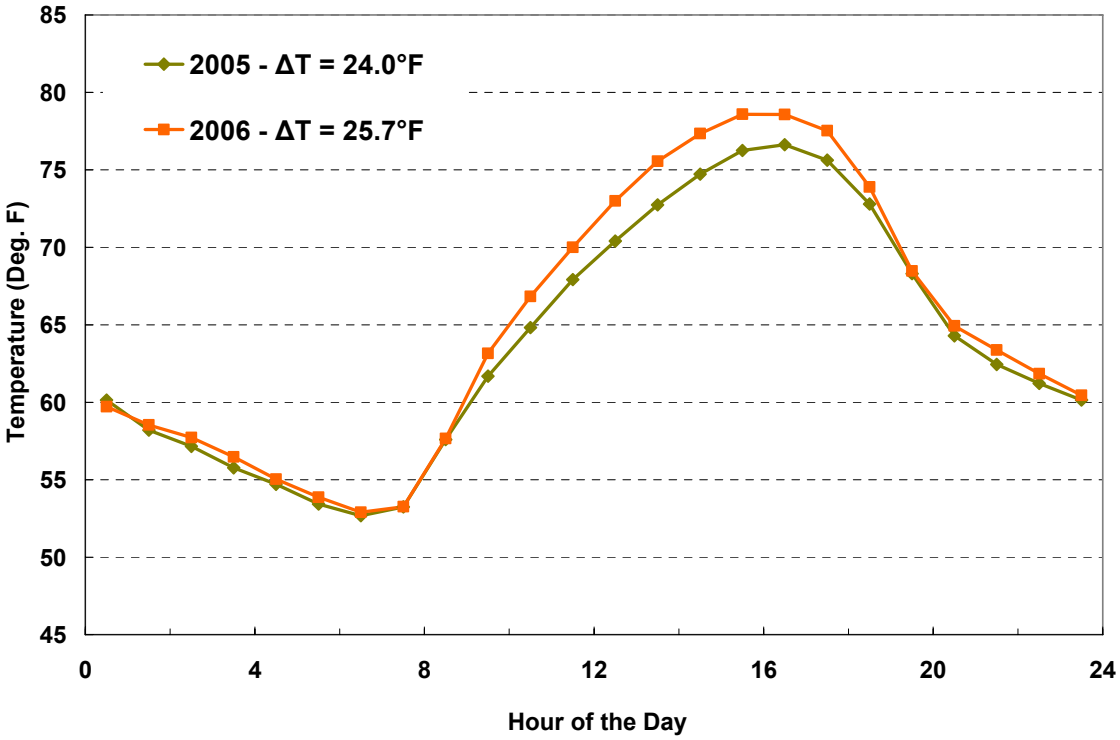

Figure 9: Average diurnal temperature cycle for two locations during the 2005 and 2006 ripening periods (mid-August through mid-October) for Two Blondes Vineyard.

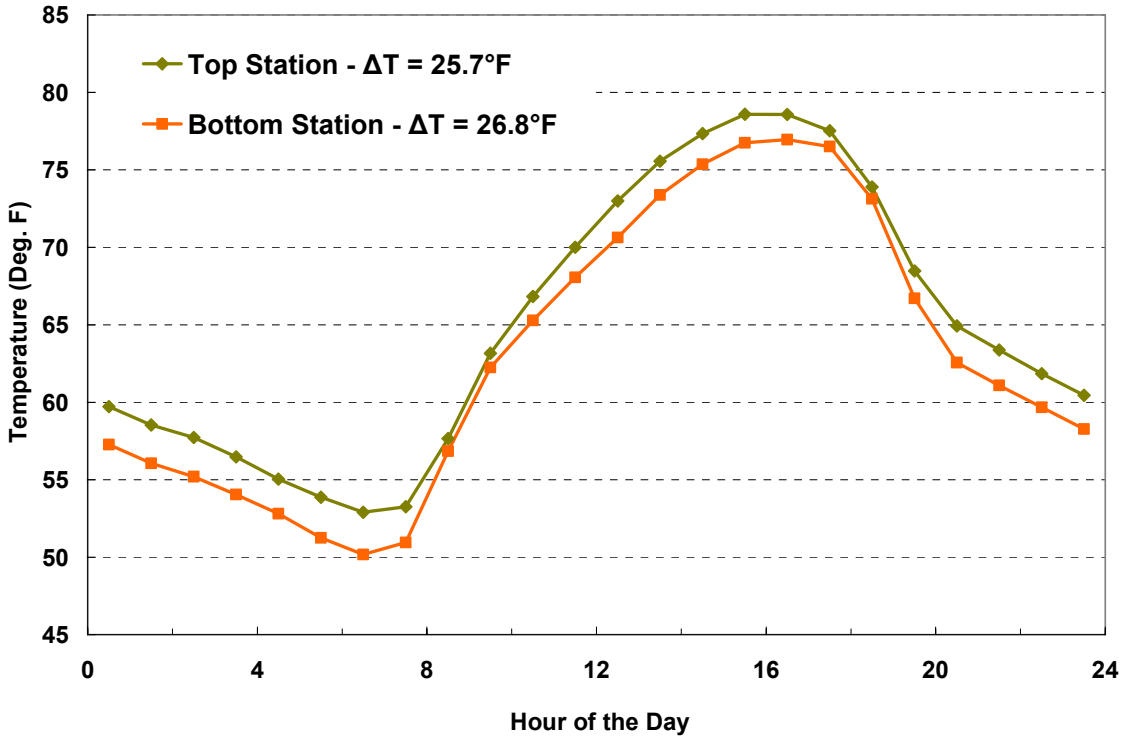

Figure 10: Average diurnal temperature cycle for two locations at Two Blondes Vineyard during the 2006 ripening period (mid-August through mid-October).

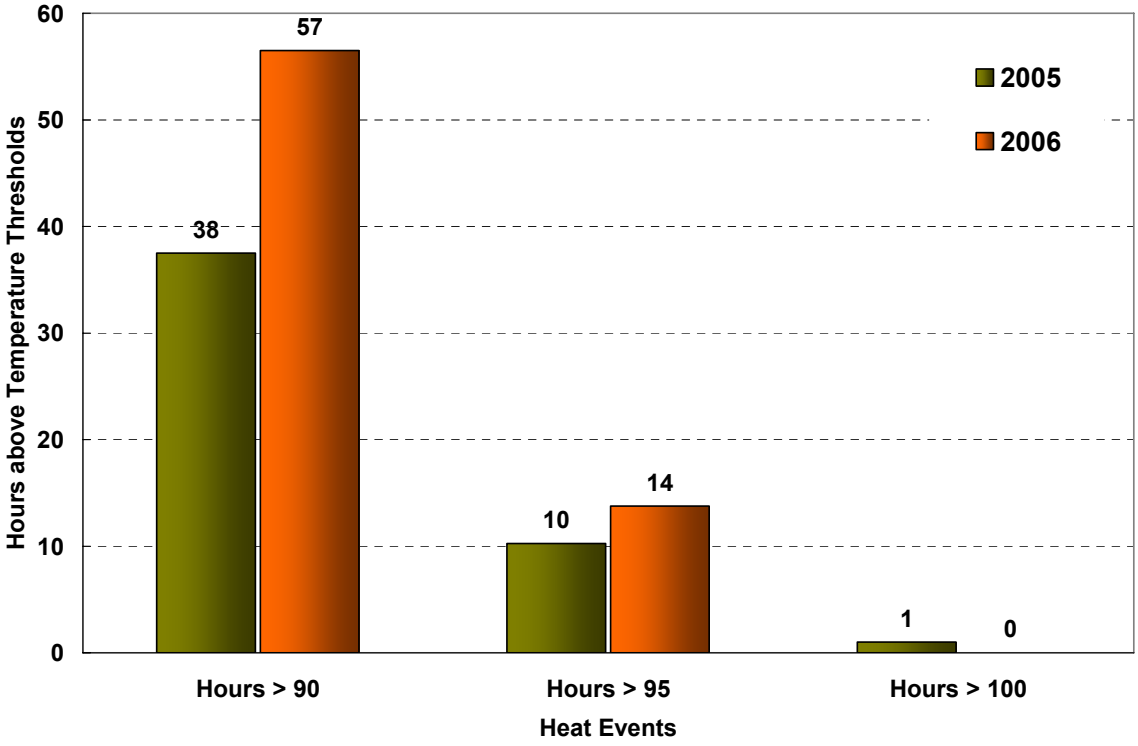

Figure 11: Hours above given critical temperatures during the ripening stage in 2005 and 2006 for Two Blondes Vineyard.

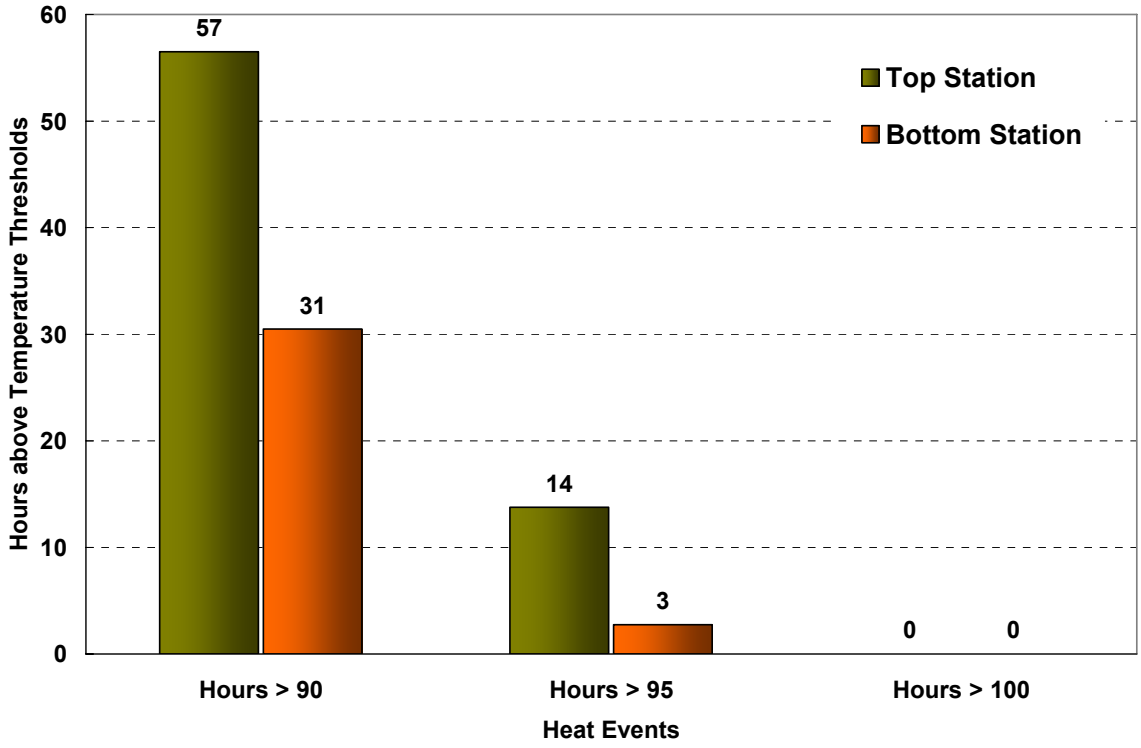

Figure 12: Hours above given critical temperatures during the ripening stage in 2006 for two locations at Two Blondes Vineyard.

Finally, it is instructive to evaluate the time during which the temperatures exceeded given threshold levels during the ripening period (Figs. 11 and 12). While foliage and fruit temperatures are of primary importance (not ambient temperatures), we can estimate that foliage temperature roughly tracks air temperature ± a few degrees, depending on stomatal opening or closure. Fruit temperature, on the other hand, is difficult to broadly determine. However, fruit in persistent shade will equilibrate to ambient temperature, while fruit exposed to sunlight will reach at least 15°F above ambient temperature. 90°F represents a temperature where photosynthesis in the leaves diminishes. There were more hours above 90°F in 2006 than in 2005. However, the bottom station experienced much fewer hours above that threshold than did the top station.

At 95°F, leaf photosynthesis is essentially zero while 100°F is the temperature at which heat shock proteins are produced by the plant (a protection against heat stress). In the fruit, secondary metabolism (responsible for anthocyanin, tannin and flavor precursor formation and degradation) is highly sensitive to temperature, although the optima and maxima have not been elucidated by researchers yet. However, it is clear that, at hot temperatures (especially those of exposed fruit), anthocyanins are degraded resulting in lower extractable wine color. Fruit aromatic compounds are similarly degraded.

At Two Blondes Vineyard, 2006 exhibited slightly (only four) more hours above 95°F than 2005, though the number of hours of fruit-degrading temperatures were very few. Again, the bottom location received many fewer hours above this threshold than the top location. Neither location experienced any temperatures above 100°F. The scarcity of high temperature events indicates that high heat stress conditions are not a common occurrence at this vineyard, which is a strong positive characteristic. There does not appear to be a reason to protect fruit from direct

sunlight, thus the canopy may allow for some fruit exposure. That will allow the fruit to attain high quality with a rapid degradation of undesirable vegetative character during the ripening process.

III. Frost/Freeze Risk Analysis

Note: Upon review of the 2005 weather summary for Two Blondes Vineyard, the temperature thresholds indicated for potential winter kill were decidedly too high. Temperatures need to reach about 0°F for winter kill to be a risk. There were no hours of temperatures below this level. The lowest recorded temperature was 7°F, which was unlikely to have caused any damage to dormant buds. However, there were no data recorded during the month of January, so it is possible that lower temperatures were experienced during that month.

The bottom station is most likely to be affected by frost, due to its consistently lower minimum temperatures than the top station (Figure 14). However, most of the frost hours occurred during the month of March, which is well before any budbreak could have occurred. The latest frost occurred on April 18th at the lower station, but not at the upper. Hence, there appears to be a potential for frost hazard, though temperatures warm rapidly during April, which may make frost a relatively rare occurrence. Nevertheless, the low spots may be at risk for frost damage. And there were about the same number of hours in 2006 as in 2005 during April (Figure 13).

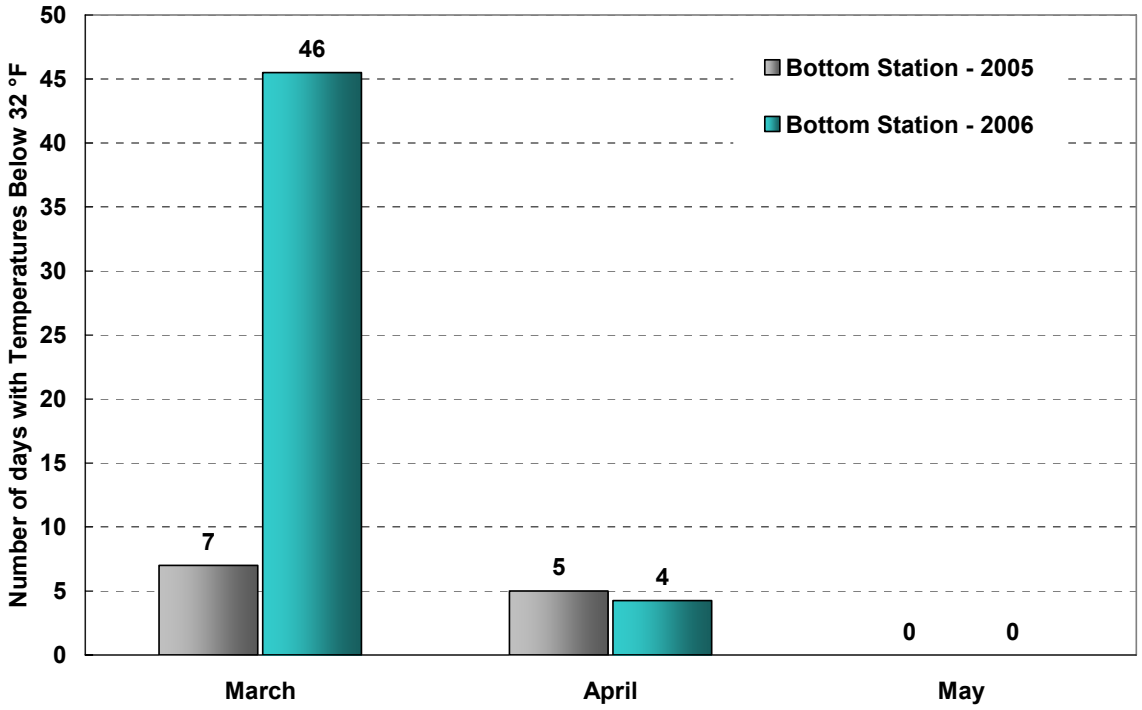

Figure 13: Average number of hours below selected temperature thresholds for two locations at Two Blondes Vineyard during February 2005 through December 2005.

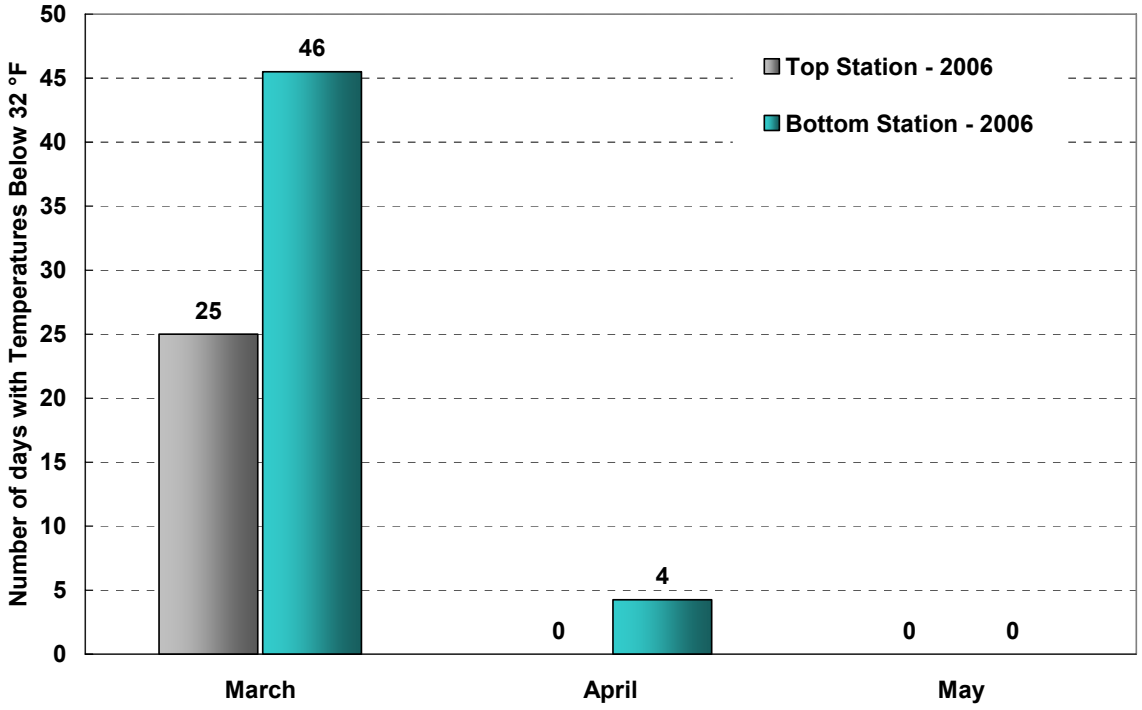

Figure 14: Average number of days below 32°F during March-May for two locations at Two Blondes Vineyard.

IV. Conclusions

This limited data set suggests that there are sufficient heat summation units available to ripen all Bordeaux varieties. The season length is short, but temperatures warm quickly in spring, allowing vine development to catch up with other growing regions, such as those at lower latitudes. However, temperatures also fall rapidly during the fall, so fruit must mature by early October, or it will have difficulty achieving flavor maturity.

The lack of extreme temperatures during ripening is a benefit to this vineyard, as this will allow fruit to ripen without potential for sunburn or other degradation due to excessive heat. However, there may be high temperatures before fruit has reached veraison, since July temperatures tend to be warm to hot. Heat during July may also be damaging to the green berries, so some heat protection should be maintained, in the form of retained leaves on the afternoon sun side of the canopy.

The mild temperatures during ripening are accompanied by mild, but not cold, temperatures at night (at least early in the ripening period). This will allow for some “night ripening” of fruit, which allows flavors and tannins (etc.) to develop without accompanying sugar accumulation, which occurs during daylight hours. The net result is that flavor maturity may be reached before sugar (and potential alcohol) levels become excessive.