

Relationships between Topography, Soil Type, and Vineyard Temperatures Within the Walla Walla Valley American Viticultural Area

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Variations in ambient air temperatures between vineyard sites within the Walla Walla Valley American Viticultural area (AVA) are controlled largely by elevation and relative proximity to major stream valleys. The Walla Walla Valley is a structurally controlled basin centered on a broad syncline in the Columbia River basalt. It is bounded on the east by the anticlinal Blue Mountains and on the south by the Vansycle Ridge escarpment, a segment of the Olympic-Wallowa lineament (OWL). On the west, near its intersection with the Columbia River, the Walla Walla Valley is constricted by Nine Mile Hill, a ridge that impinges on the OWL produced by minor folds in the basalt bedrock. This constriction inhibits the drainage of cold air from the upper parts of the valley and commonly produces early morning temperature inversions. Cold air pooling behind the constriction reduces average temperatures, growing degree-days, and average frost-free days and increases diurnal temperature variation for lower elevations within the AVA. Average temperatures increase and diurnal variations decrease with elevation in the Walla Walla Valley AVA to an elevation of approximately 450 m. These trends reverse as elevations increase beyond 450 m in the foothills of the Blue Mountains. Average ambient air temperatures in vineyards near the base of the Vansycle Ridge escarpment are anomalously high for their elevations due to the local influence of down sloping adiabatically warmed winds. Average ambient air temperatures in vineyards near major stream channels are anomalously low for their elevations due to the proximity of cold air streams derived from the higher elevations of the Blue Mountains. Average ambient air temperatures 1.5 m above the surface do not appear to be strongly affected by soil type or ground cover. Average grape cluster temperatures within the vineyards are controlled by ambient air temperature, geomorphology, average wind speed and direction, soil type, and vineyard management practices. Groundcover material and its influence on ground surface temperatures strongly influences grape cluster temperatures. In general, the increase in grape cluster temperature relative to ambient air temperature is greatest in sites dominated by exposed soil or rocks. Vineyard sites covered in grass generally have smaller increases in average surface, cluster, and shallow soil temperatures relative to ambient air temperature.