2018-001185-P

Petition to Establish

Upper Lake Valley AVA

Submitted by the Growers of Upper Lake Valley

Written by Terry Dereniuk
December, 2017

This petition seeks to establish the Upper Lake Valley AVA within the larger Clear Lake AVA. The proposed area is comprised of valleys that run in a north-northeasterly direction from the shores of Clear Lake, in Lake County, California. The alluvial valley floors are at elevations of 1330 to 1480 feet above sea level. The proposed area includes the surrounding hillsides that rise 200 feet above the valley floors. Vineyards are currently planted at 1330 to 1450 feet elevation. The topography of the proposed area affords vineyards planted there to enjoy excellent sun exposure and air movement.

The region is bordered by Clear Lake to the south, the Mendocino National Forest and Coastal Mountain Range on the north and east, and the mountainous terrain of the Mayacamas Mountains on the west. The proposed Upper Lake Valley, which includes Bachelor Valley, Middle Creek Valley, Clover Valley, and a section of the northern shore of Clear Lake to east to Nice and southwest to the outskirts of Lakeport totals about 17,360 acres. Differences in geology, soils, and climate distinguish the proposed viticultural area from surrounding region.

The Upper Lake Valley area has a long history of agriculture and viticulture earning recognition for wines as far back as the turn of the last century. The valleys are known to have similar soils, weather patterns, water quality, and topography that produces distinctive high quality winegrapes. A number of wine grape varietals are grown in the proposed viticulture area with Sauvignon Blanc being the most well-known. The proposed area's soil, and moderate climate with bright sunny days and cool nights produces remarkable Sauvignon Blanc wine grapes which have established Lake County as one of the premier California regions for this varietal.

There are currently sixteen winegrape growers farming with about 300 acres planted to vines. There is also one custom crush winery facility in the proposed area. Appendix Exhibit 1, page 60, contains a listing of growers and wineries in the proposed area. We are therefore, petitioning the Alcohol, Tobacco & Trade Bureau (TTB) for a specific designated and delineated growing region to be called Upper Lake Valley AVA.

Figure 1 Sandy Bend Vineyard located along Middle Creek in Upper Lake, CA

History

The proposed Upper Lake Valley area includes Bachelor Valley, Middle Creek Valley, Clover Valley, and shoreline of Clear Lake to the southwest and southeast. Settled in the mid-1800s, the proposed area was part of the Upper Lake Township. The economy included agriculture, mineral spring tourism, and lumber.

The mineral springs in Witter Springs brought visitors from the Bay Area to enjoy the health benefits associated with the waters. Lumber was also an important aspect of the economy. Elk Mountain and other ridges that ringed the valleys were forested with hardwoods that were logged and milled to produce lumber for building.

The history of agriculture and particularly viticulture in the proposed area of Upper Lake Valley was rich and extensive. In The History of Napa Lake Counties – Lake, the products of the proposed area, then a part of the Upper Lake Township were described as "the usual range of fruits, cereals, and vinicultural products.....Fruits of every description thrive excellently....Much attention is now being attracted to the growing of winegrapes and it is believed that all the mountain sides of this whole section is most excellently adapted to their culture."[1]

The area was known for wine grapes and wine as early as 1880. The following excerpt taken from the book California, Lake County by James Hilly, clarifies this statement. The area was known as being "A garden spot for the production of wine grapes and other vegetables and crops".[2]

As early as 1885, W. W. Elliot noted, "In Lake County there are now planted 600 acres of wine grapes, mostly European varieties, located in various parts of the county".[3] Approximately one-third of this acreage was located in the proposed area with S. C. Hasting farming 115 acres, George Thorington, 12 acres, and J. L Smythe, 14 acres. Varietals included Zinfandel, Franken Riesling, Golden Chasselas, Muscat, and a few of the old Mission varieties.

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[1] History of Napa and Lake Counties, California - Lake (Slocum, Bowen, & Co., Publishers 1881) page 196
[2] James Hilly, Upper Lake, A Description of Lake County California, Published by Authority of the Board of Supervisors, 1888, page 28
[3] W.W. Elliott Lithographer, Lake County Cal., (W. W. Elliott, Publisher, 1885) page 18

Early Viticulturalists

S. C. Hastings

S. C. Hastings, founder of Hastings Law School, State Attorney General, and Chief Justice of the Supreme Court farmed one hundred and fifteen acres of wine grapes on his property located one mile east of the town of Upper Lake in the Middle Creek Valley. In addition to vineyards, Hastings had a winery and distillery with a capacity of 150,000 gallons in production by 1886.

Hastings bought more property and added it to his land holdings. "His brothers Robert Paul Hastings, Charles Foster Dio Hastings joined him in this venture (Vineyards) and the property ran from Middle Creek to and including all of Nice proper." [4]

"The main feature of Upper Lake's surroundings is it peculiar adaptability for grape culture, which has been thoroughly demonstrated and test by Judge S. C. Hastings, whose experiments have resulted in the production of wine that with proper age will astonish the natives of Los Angeles and San Bernardino. There are thousands of acres of as good grape land as France, Spain, Italy or the Rhine… which are not in production at this time." [5]

The winery closed in 1900 and a few years later, legend has it that the bungs were pulled from the barrels and casks and the wine was allowed to run down a gully to the lake.

Charles Hammond

Charles Hammond, married to the sister of Teddy Roosevelt's first wife, arrived in California in 1884. He worked for Captain Niebaum in his vineyard and Inglenook Winery in Rutherford, CA. In1885 Hammond acquired six hundred acres of farm land located four miles east of Upper Lake. He planted twenty-five acres of grapes including Cabernet Sauvignon, Black Burgundy, Mataro, Carignan, a few Zinfandels, Sauvignon Vert, and White Semillon plus an olive orchard on his ranch in Upper Lake and built a winery called Ma Tel Vineyard.[6]

[4] Henry Mauldin, History of Lake County Mauldin Chronicles, Book 42, page 8225
[5] James Hilly, Upper Lake, A Description of Lake County California, Published by Authority of the Board of Supervisors, 1888, page 29
[6] Aurelius O. Carpenter and Percy H. Millberry, History of Mendocino and Lake Counties, California with Biographical Sketches, 1914

Hammond's Ma Tel Vineyard won the award for best Exhibit of two year old dry red and white wines at the World's Columbian Exposition in Chicago World's Fair of 1893.[7]

Ma Tel Vineyard also won a Bronze Medal at the Paris Exposition of 1900. [8] With Hammond's death in 1916 and the start of Prohibition in 1919, the vineyard was not cared for and the winery sat idle. In 1924, 202 acres of Hammond's property was purchased by the Manilla Club including the vineyard and the winery. The winery was used to make small quantities of wine for personal use under a special permit by the State.

Figure 2 Photograph of Ma Tel Vineyard courtesy of Hammond Library, Upper Lake, CA. Photo courtesy of Hammond Library in Upper Lake.

Gardiner G. Hammond Jr.

Charles Hammond's brother, Gardiner G. Hammond Jr. had a ranch across the road from his brother which was also located about four miles East of Upper Lake. There was a winery and twenty-five acres of grapes planted in 1885. He later sold his holding to his brother-in-law, William O. Edmonds, who was known for his orchards, vineyards, olives, and eucalyptus groves. Edmonds was also recognized by the community as a viticulturist.[9]

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[7] Henry Maudlin, Maudlin Chronicles, History of Lake County, Book 50, page 9820 & 9822; Ernest Penninou, account written for Wine Institute, 1955

[8] Ibid, book 33, page 6441

[9] Aurelius O. Carpenter and Percy H. Millberry, History of Mendocino and Lake Counties, California with Biographical Sketches, 1914

Prohibition

By 1911, there was a very active growers association representing this area. They mobilized a campaign in 1912 to defeat a local "dry" ordinance. With the advent of Prohibition in 1919, the vineyards were abandoned and replanted with other crops.

The photograph above shows Anna Morrison Reed, poet, activist, circa 1913. On an anti-Prohibition lecture tour with the Grape Growers Association[10]

Resurgence of Wine Industry

In the mid 1960's winegrapes were again planted in Lake County. The first vineyards in the Upper Lake Valley area were planted in the 1970's. According to long time grower Larry Rogers, in the early 1970's there were several pear ranchers who were searching for a diversified crop, and decided to plant test blocks of wine grapes, as historically the first agricultural product were world class wines at the end of the 19th century from the Upper Lake Valley area.

[10] Gaye Allen, Lake County Wine Guide The story of a fascinating wine region, (Meadowlark Publishing, 2014) page 33

Larry said he decided to plant Cabernet Sauvignon wine grapes upon recommendation from John Parducci, a large, successful vintner in Mendocino County. In Upper Lake a parcel was doubled-planted with pears to make a hedge row and thus freeing up land to plant the wine grapes. There was a good market for the wine grapes so more vineyards were planted with success. Over the years it was discovered that the white wine grapes were better suited for the area, due to micro-climate and soil type. Sauvignon Blanc is the premier wine-grape grown in the Upper Lake Valley area, although several other varietals are grown successfully.

Today, there are sixteen winegrape growers with about 300 acres under vine and one bonded winery in the proposed Upper Lake Valley area. (See Appendix Exhibit 2, page 61, for a map with vineyard locations.)

Name Evidence

Upper Lake Valley was selected as the name for this proposed AVA to reflect the geographical location with the valley topography of the area. The proposed area incorporates Bachelor Valley, Middle Creek Valley, Clover Valley, and a section of the northern shore of Clear Lake to Nice. Name evidence includes evidence of the geographical name, business names and government entity names.

Historical Name Evidence

Wikipedia - The proposed area is a census designated place and has been known as Upper Lake since 1875 according to Wikipedia historical information.[11] Appendix Exhibit 3, page 62 & 63, contains a screen shot of the Wikipedia website listing for Upper Lake.

Geographical Name Evidence

AAA Map – The AAA Map Ukiah-Mendocino-Fort Bragg – Clear Lake City Series, (Appendix Exhibit 4, page 64 shows the proposed area with the name Upper Lake.

Lake County Transit Route – Appendix Exhibit 5, page 65 includes a screen shot of the route map from www.lakecountytransit.com of the North Shore transit route. It includes bus service from Upper Lake.

Upper Lake Quadrangle Map – Appendix Exhibit 6, page 66, contains a photo of a portion of the Upper Lake Quadrangle Map for Upper Lake. (Lake Quadrangle map (7.5 minute series, 2015)

Government Entities

There is a U. S. Post Office located in Upper Lake at 9435 Main Street. Upper Lake has its own zip code, 95485. Appendix Exhibit 7, page 67, contains a screen shot of the search results for U. S. Post Office in Upper Lake.

The high school in Upper Lake is named Upper Lake High School. Appendix Exhibit 8, page 68, contains a screen shot of search results for Upper Lake High School.

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[11] https://en.wikipedia.org/wiki/Upper_Lake,_California

The State of California Department of Water Resources (DWR) includes a Bulletin 118 for the Upper Lake Basin. Appendix Exhibit 9, page 69, includes page 1 of this document.

Advertising and News Paper Listings

Appendix Exhibit 10, page 70, contains a screen shot of an advertisement for property on Elk Mountain Road in Upper Lake listed for sale.

Elk Mountain Vineyard is also located on Elk Mountain Road in Upper Lake. See Appendix Exhibit 11, page 71, for Lake County Record Bee newspaper fictitious business name classified advertisement for this business.

Figure 3 Harvest at Elk Mountain Vineyard, Upper Lake, CA

Upper Lake is included in the local Lake County Record – Bee News weather almanac. The paper is published 5 days a week. Appendix Exhibit 12, page 72, has a photo of the weather almanac section of the Record Bee for Saturday, December 16, 2017.

Upper Lake is often cited in news reports about the local area. Appendix Exhibit 13, page 73, contains a screen shot of an on-line article dated September 2, 2015 published on Sacbee.com about a fire near Upper Lake.

Business Names

Facebook has a page for the Upper Lake Mercantile, a gift shop located on Main Street in Upper Lake. Appendix Exhibit 14, page 74, contains a screen shot of the business page on Facebook.

The name Upper Lake appears in a number of listings in The Real Yellow Pages for Lake & Mendocino Counties, CA. Appendix Exhibit 15, page 75, has a photo of the upper left section of page 26 of the Lake & Mendocino CO Business listings.

Valley

The proposed area incorporates Bachelor Valley, Middle Creek Valley, and Clover Valley. The word "valley" is added used in the proposed name to describe the topography of the proposed area. Historically known for agriculture and viticulture, the valleys' elevation, abundance of water, and unique soils provide a rich area for viticulture.

Distinguishing Features

The distinguishing features of the proposed Upper Lake Valley are geology and hydrogeology, soils, and climate.

Geology and Hydrogeology

Geology and hydrogeology are distinguishing features of the proposed Upper Lake Valley appellation. The area is bounded by mountains to the north, east, and west and Clear Lake to the south. The vast majority of the proposed area is included in the Upper Lake Groundwater Basin.

The geology in the Clear Lake and Upper Lake Valley area contains various rock units including the Franciscan Formation, a jumble of rocks made up of deep ocean floor sedimentary rocks and ocean crust.[12] These rocks are composed of chert, greywacke, shale, metasedimentary rocks, metavolcanic rocks of blue schist grade, and ultramafic rocks which are Jurassic-Cretaceous in age. Appendix Exhibit 16, page 76, has a photo that includes the proposed area taken from the Geologic Map of California, 2010.

The Clover Valley Fault zone, part of the broad San Andreas Fault system along the eastern portion of the proposed area and includes the faults in Clover Valley, near Lucerne and shorter faults near Clearlake Highlands and Lower Lake. The seismically active Konocti Bay fault zone merges into this less well documented fault zone.[13]

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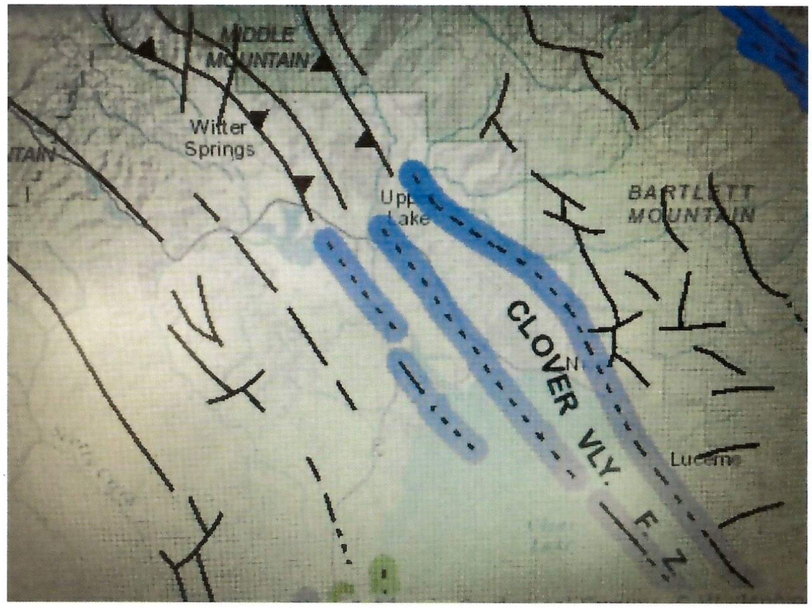
[12] John D. Sims, *Late Quaternary climate, tectonism, and sedimentation in Clear Lake, northern California Coastal Ranges*, page 3

[13] https://pubs.geoscienceworld.org/books/book/353/chapter/3796420/Tectonic-framework-of-the-Clear-Lake-basin



- *Figure 8 Earthquake fault map showing location of Clover Valley Fault zone*[14]

California's Groundwater Bulletin 118 for the Upper Lake Basin describes the formations that bound the area. "Middle Mountain is a fault-bounded block underlain by sandstone and shale of the Great Valley Sequence. Pitney and Hogback Ridges consist mainly of greywacke, sandstone and shale with minor interbedded basalt and chert of the Franciscan Formation. Similar rock types also underlie the mountain ridge south of Tule Lake."[15] The ridges of these mountains rise to about 3,800 feet above sea level.

The Upper Lake – Nice Area Plan also describes the proposed area. "Overlying the Franciscan Bedrock in the Upper Lake – Nice planning Area are dissected older terrace deposits and recent lake deposits. The thick, unconsolidated silt deposit which streams have cut to depths of ten feet, underlies all the major lowland areas of the planning area. ... The uniformly fine particle size of the deposit indicates that it is lacustrine in origin, probably deposited in a former high level state of Clear Lake."[16]

The southern portion of the proposed area was once part of the lakebed of Clear Lake. Studies by John Sims, Michael Rhymer, and others reconstructed the shifting lakebed of Clear Lake over five earlier periods in the Holocene and late Pleistocene periods. The lakebed covered a portion of the proposed area for an estimated 250,000 years as shown in B, C, and D in Figure 9 below.[17] During this period, Clear Lake drained northwest through Cold Creek Canyon into the Russian

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[14] Photo from Fault Activity Map of California, 2010, California Department of Conservation, maps.conservation.ca.gov/cgs/fam

[15] Hydrologic Region Sacramento River, Upper Lake Groundwater Basin, California's Bulletin 118

[16] Upper Lake – Nice Area Plan, page 2-7

[17] John D Sims, Michael J Rhymer, James A Perkins, Late Quaternary Climate, Tectonism, and Sedimentation in Clear Lake Special Paper 214, "Late Quaternary deposits beneath Clear Lake California", (The Geological Society of America, 1988) page 41

River basin. Sometime in the last 10,000 years, a landslide on Cow Mountain blocked the Cold Creek Canyon. Over time, with the rise in the level of the lake, Clear Lake carved a new outflow into the Sacramento River watershed and the lakebed receded to its present day structure.

Late Quaternary deposits beneath Clear Lake 41

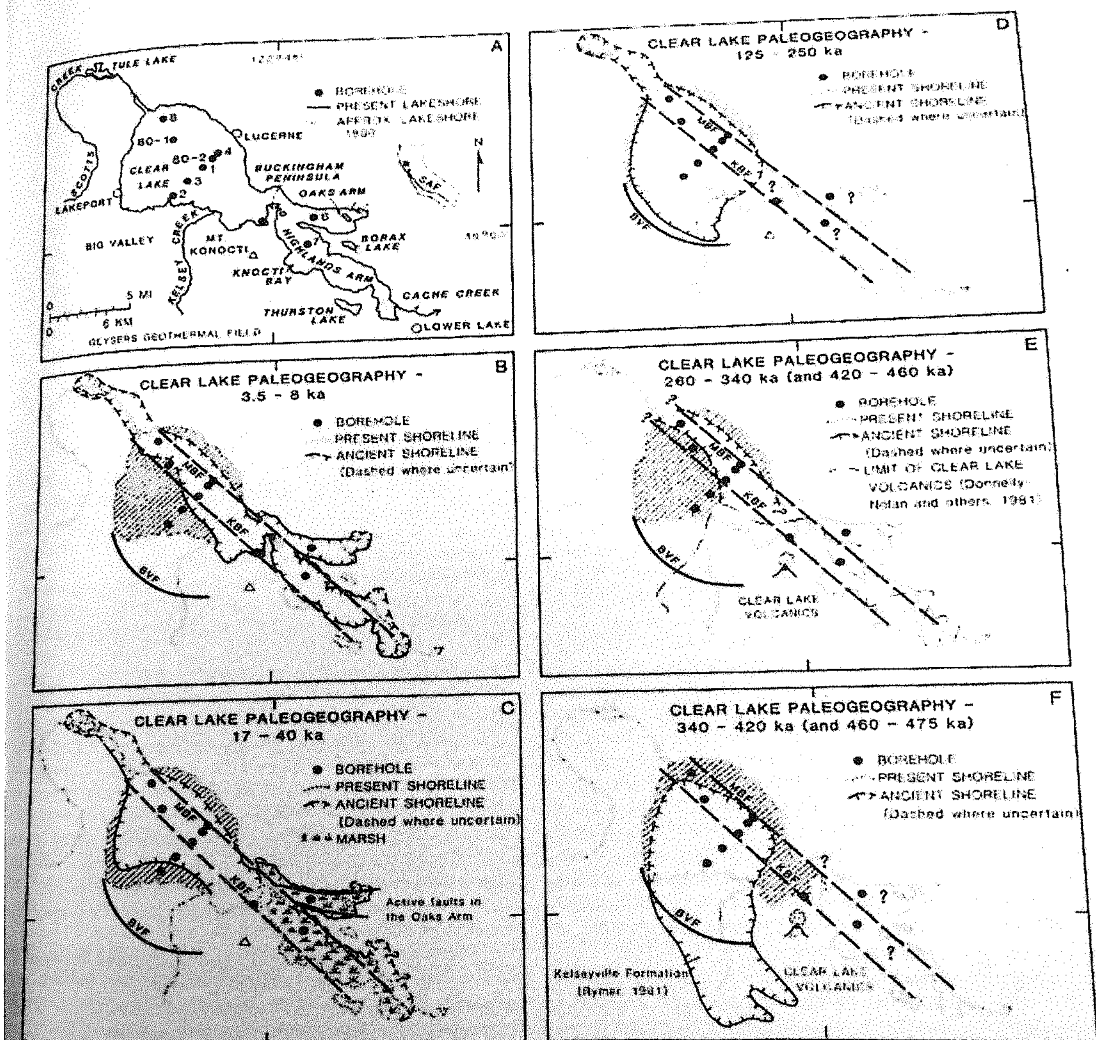

Figure 10. Paleogeographic reconstruction of Clear Lake at present and five earlier times in the Holocene and late Pleistocene. Hatchured areas indicate subaerial exposure of previously deposited lake sediments; dashed areas, questionable. Stippled areas represent prelacustrine bedrock areas now occupied by Clear Lake. Faults that affected the position of the lake shoreline are shown by the following: KBF, Konocti Bay fault and its extension into the main basin; MBF, Main Basin fault from Sims and Rymer (1975a) and its extension into the Highlands Arm of the lake; BVF, Big Valley fault. Unnamed faults in the Oaks Arm of Clear Lake are also shown.

Figure 9 Reconstruction of the shifting lakebed of Clear Lake

Water-Bearing Formations of the Upper Lake Basin

The proposed Upper Lake Valley has four identified water-bearing formations: Quaternary alluvium; Pleistocene terrace deposits; Pleistocene lake and floodplain deposits; and Plio-Pleistocene Cache Creek Formation. The Quaternary alluvium and Pleistocene terrace, lake, and floodplain deposits are the primary sources of groundwater in this area. The older Pleistocene Terrace deposits that border the west and northwest sides of Middle Creek Valley and Plio-Pleistocene Cache Creek Formation deposits along the borders of the valleys are less important sources of groundwater due to low permeability of the rock units. The deposits that form the water bearing formations of the Upper Lake Basin are from the Cenozoic period and are between 10,000 and 1.8 million years old.

Quaternary Alluvium – Alluvium is defined as clay, silt, sand, gravel, or similar detrital material deposited by running water.[18] Channel deposits, fan deposits, and older alluvium consisting of gravel, sand, and fines make up the Quaternary alluvium in the Upper Lake Basin. The deposits are Pliocene to Holocene in geologic age.[19]

Un-cemented gravel and sand with silt and clay lenses form the base for the active channels of Middle Creek, Alley Creek, and Clover Creek. Fan deposits and older alluvial deposits of a mixture of gravel, sand, and fines that are 40 to 50 feet thick (DWR 1957) line the openings of ravines and small canyons that enter the valleys.[20]

Pleistocene Lake and Floodplain Deposits – The valley floors of Middle Creek, Alley Creek, and Clover Creek sit over deposits of fine grained lacustrine sediments and coarser grained flood plain deposits. These deposits overlie bedrock and older unconsolidated sediments and generally range from 60 to 110 feet in thickness. Sediments in the Middle Creek Valley form a confining layer, creating an artesian aquifer (ESA 1978). [21]

Sand and gravel lenses from former stream channels make up the floodplain deposits The fine-grained lake deposits have low permeability with specific yields from about 3 to 5 percent but wells constructed in the sand and gravel lenses produce an average of 230 gallons per minute (DWR 1957). [22] The deposits are Miocene to Pleistocene in geologic age.[23]

The diagram in Figure 10 shows the confined aquifer and free ground water in the Upper Lake Basin. The artesian aquifer is believed to extend from the northern end of Middle Creek Valley

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[18] www.MerriamWebster.com

[19] U S Geological Survey: Geologic units in Lake County; California, https://mrdata.usgs.gov/geology/state/fips-unit.php?code=f06033)

[20] California Groundwater Bulletin 118, Upper Lake Basin, Hydrologic Region Sacramento River, High Valley Groundwater Basin, last update 2/27/04

[21] Lake County Groundwater Management Plan, (Lake County Watershed Protection District, March 31, 2006), page 2-9

[22] Ibid

[23] U S Geological Survey: Geologic units in Lake County; California, s

near Hunter Bridge to at least as far south as State Highway 20.[24] The majority of wells in the area are drilled into this layer with yields averaging 230 gallons per minute (GPM). Yields of several hundred gallons per minute are common and an unconfirmed report noted that one well yielded 2,000 GPM.[25]

[24] Earth Science Associates, Upper Lake Groundwater Investigation for Lake County Flood Control and Water Conservation District, January, 1978, page III-4
[25] Ibid, page III-5

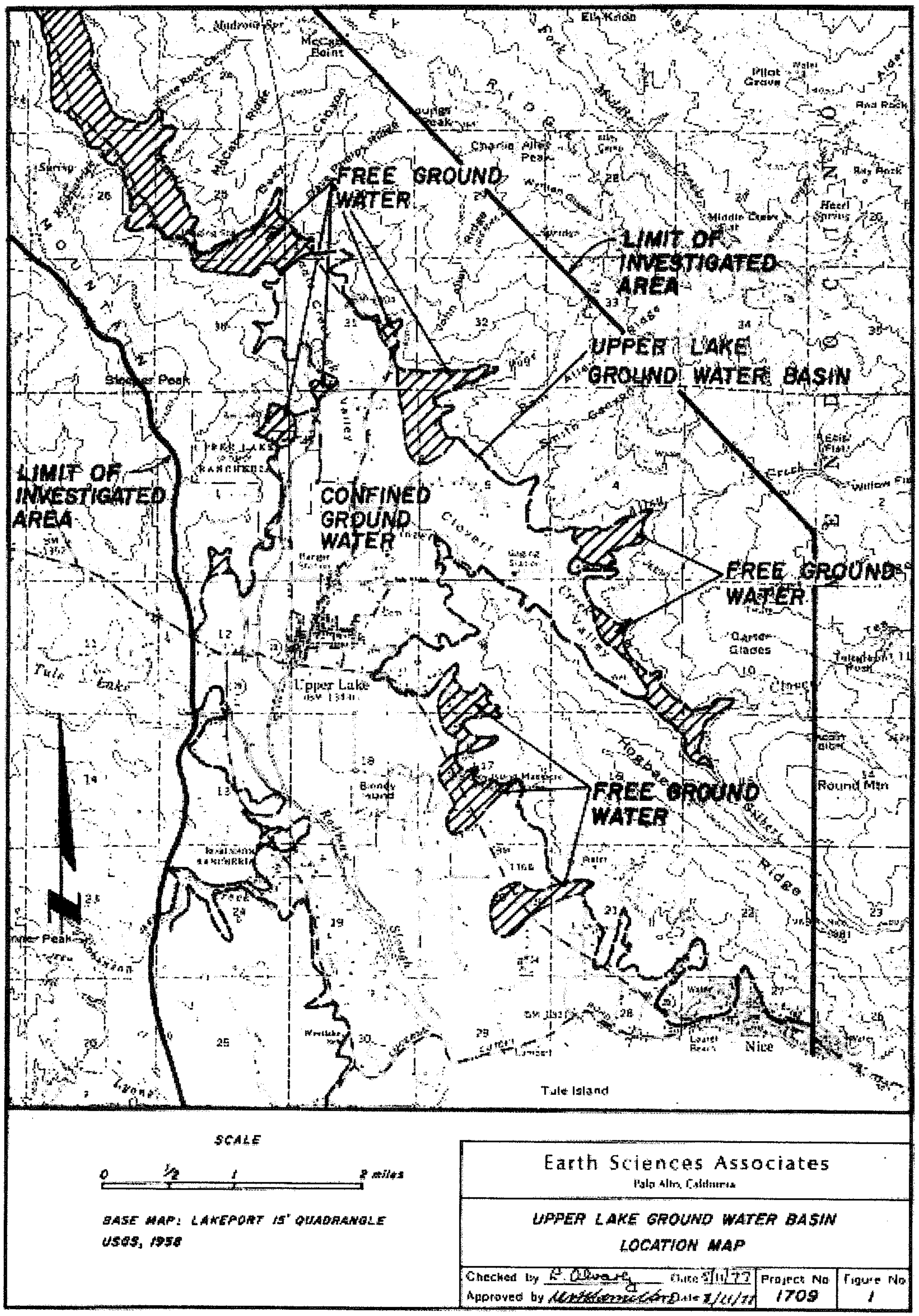

Figure 10 Map of the Upper Lake ground water basin showing the location of the confined artesian aquifer, Earth Science Associates, 1978

The Upper Lake Basin Bulletin 118 characterizes the predominant groundwater types in the Upper Lake Basin as magnesium bicarbonate and calcium bicarbonate. Total dissolved solids average 500 mg/L. Water quality analyses show high iron, manganese, and calcium as well as electrical conductivity (EC), ASAR, and TDS in some samples. Boron is noted as detected in some wells but high boron is not associated with the groundwater in the proposed Upper Lake Valley area.

The 1978 study of the Upper Lake Basin by Earth Science Associates included an analysis of ground water from two locations over a period of more than 25 years recording low total dissolved solids ranging from 76 ppm to 250 ppm. The table is shown in Appendix Exhibit 17, page 77. This same report states, "Water quality is generally excellent for irrigation and domestic purposes."[26]

Total Dissolved Solids water quality data was also secured from the California Department of Water Resources (CDWR) as a more recent comparison point. Four wells that are monitored by CDWR are located in the proposed area. Water quality data for these wells is available from 1958 to September, 2007. TDS measurements over this period recorded TDS measurements from a low of 105 to a high of 268. Appendix Exhibit 18, page 78, contains a map showing the location of the four monitoring stations. The table in Appendix Exhibit 19, page 79, includes TDS data by station and sample date.

Many factors influence the quality of groundwater and include the "lithological and hydrological properties of the geologic unit, the various chemical processes occurring within the geologic unit, and the amount of time the water has remained in contact with the geologic unit (residence time)."[27]

Total dissolved solids also provide a measure of the suitability of water for crop irrigation. The table below in Figure 11 [28] was taken from a study on irrigation water quality standards by Texas A&M breaks down water classes as measured by electrical conductivity and further by gravimetric analysis. Using this chart, groundwater in the Upper Lake Basin would be considered Class 2 irrigation water.

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[26] Earth Science Associates, Upper Lake Groundwater Investigation for Lake County Flood Control and Water Conservation District, January, 1978, page I-2

[27] Groundwater Quality, https://pubs.usgs.gov/wri/wri024045/htms/report2.htm#GROUND-WATER QUALITY

[28] Guy Fipps, Associate Professor and Extension Agricultural Engineer, "Irrigation Water Quality Standards and Salinity Management Strategies", Texas A&M Agrilife Extension Service, AgriLifeExtension.tamu.edu, page 7

Table 4. Permissible limits for classes of irrigation water.		
	Concentration, total dissolved solids	
Classes of water	Electrical conductivity μmhos*	Gravimetric ppm
Class 1, Excellent	250	175
Class 2, Good	250-750	175-525
Class 3, Permissible[1]	750-2,000	525-1,400
Class 4, Doubtful[2]	2,000-3,000	1,400-2,100
Class 5, Unsuitable[2]	3,000	2,100

*Micromhos/cm at 25 degrees C.
[1]Leaching needed if used
[2]Good drainage needed and sensitive plants will have difficulty obtaining stands

Figure 11 Classes of Irrigation Water

Groundwater levels are generally within 10 feet of the surface in the spring and fluctuate between 5 and 15 feet lower in the fall. Groundwater flows from the basin south to Clear Lake.[29]

Studies by Earth Science Associates provide more detail on the differences in average depth to water across the basin. In the northern end of Middle Creek it varies between about 25 feet in the winter to about 38 feet in the summer. Closer to the town of Upper Lake, average depth to water is 2 to 3 feet in the winter to about 30 feet below the surface in the summer. In Clover Valley, the average depth to water is similar to the town of Upper Lake, with 2 to 3 feet in the winter and about 28 feet in the summer. Closer to Clear Lake, the water is at or near the surface in winter and about 10 feet below the surface in summer.[30]

Although the most recent Upper Lake Basin Bulletin 118 notes that groundwater trend analysis is incomplete, the 1978 study by Earth Science Associates noted "The groundwater basin under present use conditions has not been overdrawn. Lowering of water levels during the dry months has not been excessive and is balanced by rapid recovery of water level elevations during wet months."[31]

<u>Importance to Viticulture</u>

Geology is defined as: *"a science that deals with the history of the earth and its life especially as recorded in rocks: b: a study of the solid matter of a celestial body (as the moon)"* by Webster[32]. This website further defines agricultural geology as: *"the branch of geology that deals with the character and origin of soils, the occurrence of mineral fertilizers, and the behavior of underground water"*.

[29] Lake County Groundwater Management Plan, (Lake County Watershed Protection District, March 31, 2006), page 2-9

[30] Earth Science Associates, Upper Lake Groundwater Investigation for Lake County Flood Control and Water Conservation District, January, 1978, page V-4

[31] Ibid, page I-2

[32] Merriam – Webster, An Encyclopedia Britannica Company, www.merriam-webster.com/dictionary/geology

Numerous articles have been written about the role of geology in viticulture including the often quoted Terroir, The Role of Geology, Climate, and Culture in the Making of French Wines by James E. Wilson. In a more recent article on Geology and Wine in South Africa, the following comment articulates a similar connection between geology and its impact on viticulture: "The role of soils and the geology of the underlying bedrocks is an important component of *terroir,* the French term describing the natural environment influencing the grape vine and ultimately the taste and quality of the resultant wine."[33]

Water for irrigation is critical for winegrape production. Groundwater is a primary source of irrigation water for viticulture and other agriculture in the proposed Upper Lake Valley area. The geologic water-bearing formations of the Upper Lake Basin provide groundwater that is suitable for irrigation and has few impairments.

Impairments in groundwater chemistry can impact plant growth or suitability of water for irrigation and other purposes. High iron in ground water can cause clogging of micro-sprinklers and foliar spotting. Manganese can also cause clogging of irrigation equipment and, above 2.0 mg/L may be toxic to certain plants. Calcium below 40 mg/L may cause plant deficiency and above 100 mg/L may cause phosphorus (P) and magnesium (Mg) deficiency. Boron (B) is toxic to most plants above 2.0 mg/L.[34]

Dissolved solids are primarily the mineral components that are dissolved from rocks and soil. Calcium (Ca) and magnesium (Mg) are dissolved from many rocks and soil with limestone, dolomite, and gypsum being the most common. These ions cause most of the hardness properties in water. Bicarbonate (HCO_3) is created by the action of carbon dioxide in water on rocks such as limestone and dolomite. Combined with calcium and magnesium, bicarbonate gives water its hardness. Total dissolved solids (TDS) also provide a measure of the suitability of water for crop irrigation.

Elevated conductivity levels in water can damage growth media and rooting function resulting in nutrient imbalances and water uptake issues. TDS levels above about 2,000 mg/L are very likely to cause plant growth problems. The sodium adsorption ration (SAR) is used to assess the relative concentrations of sodium, calcium, and magnesium in irrigation water and provide a useful indicator of its potential damaging effects on soil structure and permeability. [35]

Boundary Discussion

The map shown below in Figure 12 was taken from the Lake County Groundwater Management Plan document and is included here as a reference for the discussion that follows.

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[33] Christopher J Bargmann, Geology and Wine in South Africa, Geoscientist, Vol. 15, No. 4, April 2005, www.wosa.co.za

[34] Brian Swistock, Interpreting Irrigation Water Tests, www.extension.psu.edu, pages 2-3

[35] ibid, page 4 - 5

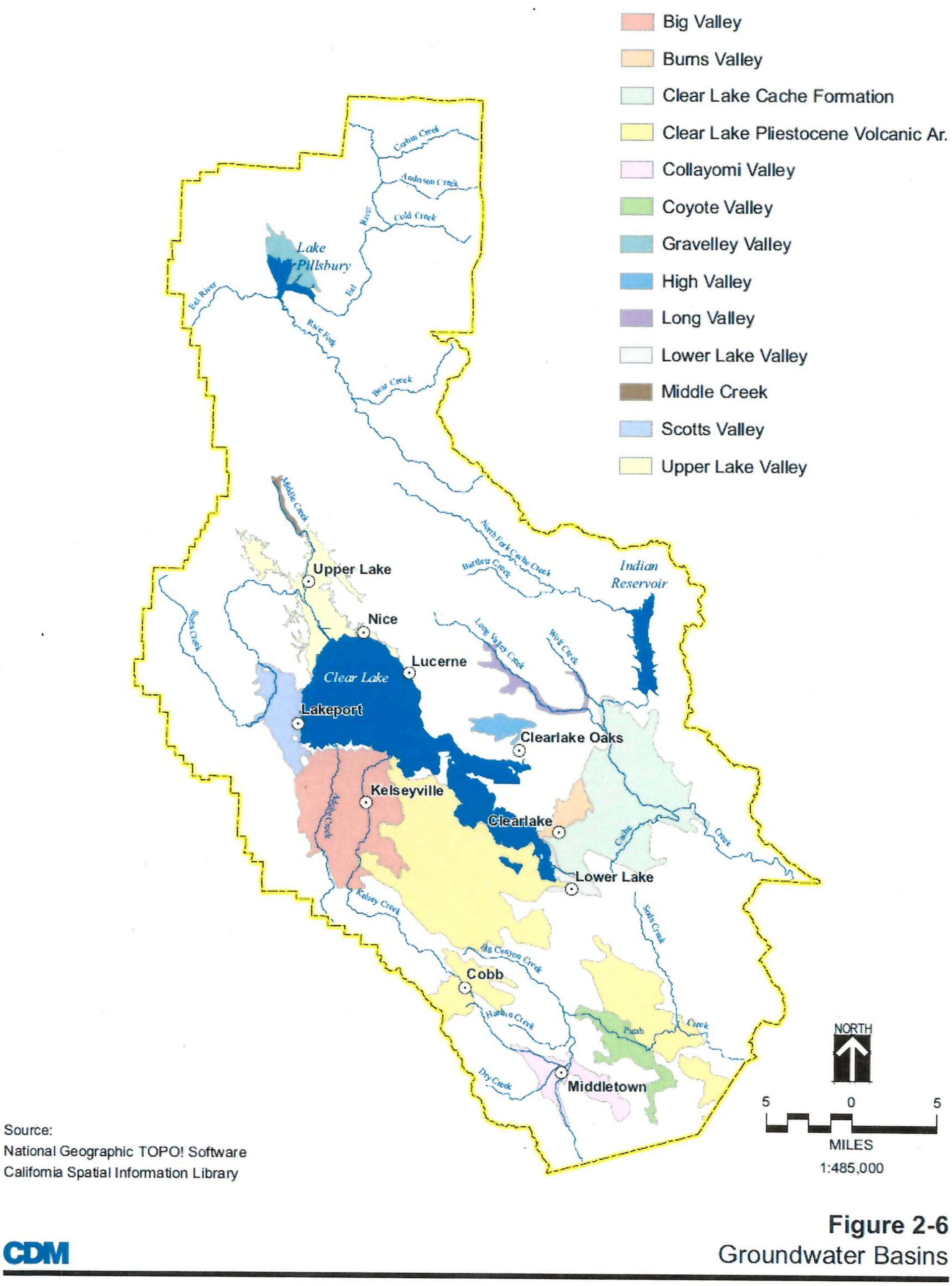


Figure 12 Lake County Groundwater Basins showing location of basins discussed in the following narrative. (Lake County Groundwater Management Plan)

North – The Mendocino National Forest lies north of the proposed area. The closest groundwater basin is the Gravelly Valley Groundwater Basin. The Franciscan Formation borders this basin to the north, east, and west. Lake Pillsbury forms the southern border. There is no additional data available about this basin.

East – The High Valley Groundwater Basin lies east of the proposed area. This basin is bordered by rocks of the Jurassic-Cretaceous Franciscan Formation and Quaternary Holocene volcanic. Holocene volcanic rocks are the major water bearing formation for this basin. Groundwater is characterized as magnesium bicarbonate and total dissolved solids average 598 mg/L. Impairments include high ammonia, phosphorus, chloride, iron, boron, and manganese.[36]

The High Valley spring groundwater level is 10 to 30 feet below the surface with the summer drawdown 5 to 10 feet below the spring level. Spring groundwater levels have fluctuated widely over the years, with incidences of slow recovery after periods of drought.[37]

South - The Big Valley Groundwater Basin lies south of the proposed area. This basin is bordered by Plio-Pleistocene extrusive rocks and rocks of the Jurassic-Cretaceous Franciscan Formation. The Big Valley Groundwater Basin is much larger than the Upper Lake Basin, with a surface area of 38 square miles. The most important groundwater formations in this basin are Quaternary Alluvium and Upper Pliocene to Lower Pleistocene Volcanic Ash Deposit.

Water in the Big Valley basin is generally characterized as magnesium bicarbonate and total dissolved solids average 535 mg/L. Boron is noted as an impairment in water in some parts of the basin in Bulletin 118. The Upper Lake Groundwater Investigation by Earth Science Associates contained similar findings and noted, "In the Big Valley, several high-boron wells are situated along or near the buried trace of the Big Valley fault." Boron is toxic to most plants above 2.0 mg/L.

The Lake County Groundwater Management Plan reports that spring groundwater levels in the northern portion of the Big Valley basin are usually 5 feet below the surface and decrease from 10 to 50 feet during the summer. In the uplands of the Big Valley, the depth to water in the spring is much deeper, 70 to 90 feet below the surface, decreasing 30 to 40 feet over the summer.[38] The same document further states, "Groundwater in the Big Valley Groundwater Basin may be over-drafted during periods of drought, when there is inadequate recharge during winter months to replace water extracted during the summer months."[39]

West – The Scotts Valley Groundwater Basin lies to the southwest of the proposed area and shares the northern boundary with the Upper Lake Basin. Rocks from the Jurassic-Cretaceous

[36]California Groundwater Bulletin 118, High Valley Basin, Hydrologic Region Sacramento River, High Valley Groundwater Basin, last update 2/27/04

[37] Lake County Groundwater Management Plan, (Lake County Watershed Protection District, March 31, 2006), page 2-22

[38] Ibid, page 2-17

[39] Ibid, page 2-20

Franciscan Formation form the basement rocks of this area. Quaternary Alluvium is the major water producing formation. Water in this basin is characterized as calcium-magnesium bicarbonate and total dissolved solids average 158 mg-L. Iron, manganese, and boron are impairments of groundwater in the basin.

Depth to water in the spring is 10 feet below the surface on the average with spring to summer drawdown ranging from 30 to 60 feet below spring levels depending on location across the Scotts Valley basin. Anecdotal evidence suggests that some wells may experience de-watering during the summer. In addition, hearsay reports of elevated well casings across the valley suggest that the valley may have subsided by as much as four and one-half feet.[40]

Soils

Soil is a distinguishing feature of the proposed Upper Lake Valley area. With elevations of 1330 to 1480 feet above sea level, Bachelor Valley, Middle Creek Valley, and Clover Valley run in a north-northwest direction. They are surrounded by hillsides that rise 200 feet above the valley floors. Clear Lake forms the boundary of the proposed area at the southern end with the Mayacamas Mountains on the west, and Mendocino National Forest and the Coastal Mountain Range to the north and east.

Soil survey maps for the Upper Lake Quadrangle, Lakeport Quadrangle, Bartlett Mountain Quadrangle, and Lucerne Quadrangle were examined and assistance was secured from the Lakeport office of the National Resource Conservation Service (NRCS) to identify the predominant soils found in the proposed area. Appendix Exhibit 20, page 80, is a map of the soils in the proposed area created by NRCS for this project. Members of the grower community provided feedback from their experience to ensure that the boundaries of the proposed area were logical and inclusive.

Many different soil series make up the soils of this area. The soils were shaped over time by the forces of geology, water, and weather. The area can be broadly characterized by three general soil map units, Millsholm-Skyhigh Bressa (MSB), Still Lupoyoma (SL), and Tulelake – Fluvaquentic – Haplawuolls (TFH). Soils in these three units make up over 56 percent of the total area.

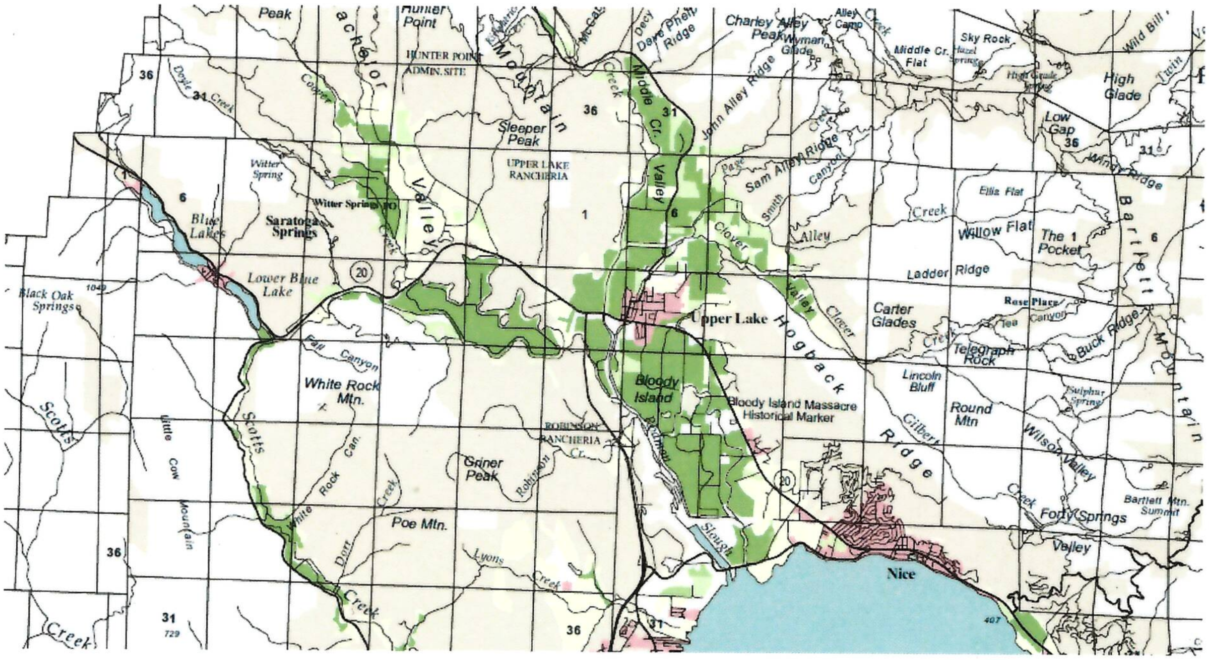
Millsholm – Skyhigh – Bressa (MSB) soils are found on the hillsides surrounding Bachelor Valley, Middle Creek Valley and Clover Valley and to a lesser extent along the southern boundary of Tule Lake and east of Highway 20 in Nice. This soil unit formed from sandstone and shale. It is made up of loam and clay loam is shallow to moderately deep, with slopes that range from moderately sloping to steep.

[40] Ibid, page 2-13

The soils of the valley floors are from the Still Lupoyoma (SL) general map unit. These soils are very deep, nearly level, moderately well drained and comprised of loam and silt loam. The proposed area contains more than 30 percent of the soils of this general map unit found in Lake County. The effective rooting depth of these soils is generally 60 inches or more. Characterized as prime farmland, some of the most productive agricultural land in the county is in this unit with predicted yields for winegrapes falling in the 5 to 6 tons per acre category. The majority of the soils for acres currently planted to vineyard in the proposed area are planted in this general soil map unit. Appendix Exhibit 21, page 81 - 83, contains a copy of Table 6, Yields per Acre of Crops and Pasture from the Lake County Soil Survey showing predicted yields. Of note, Table 6 includes the yields for winegrapes grown in soil series 158, 176, 233, and 234 that are all part of this general map unit.

The third general map unit found in the southwestern section south of State Highway 20 is Tulelake - Fluvaquentic – Haplawuolls (TFH). This soil occurs in marsh and reclaimed areas around Clear Lake with the area known as Tule Lake in the proposed area making up 64 percent of the map unit in Lake County. TFH is very deep silty clay loam with drainage that ranges from very poor to poor. Wetland and marsh areas occupy most of this soil type with areas that are drained making good growing areas for hay, pasture, and some specialty crops.

The map in Figure 13 below shows the location of prime farmland in the valleys of the proposed area. Soils in the Still-Lupoyoma map unit including series 158, Lupoyoma, 178, Maywood Variant, 233 Still Loam, and 234, Still Gravelly Loam and Tulelake series 238 Tulelake silty clay loam, flooded, and 239 Tulelake silty clay loam, protected, are found in the proposed area and are listed as prime farmland in the Soil Survey of Lake County, California. Theses soils comprise 40 percent of the total acres in the Upper Lake Valley area.



PRIME FARMLAND HAS THE BEST COMBINATION OF PHYSICAL AND CHEMICAL FEATURES ABLE TO SUSTAIN LONG-TERM AGRICULTURAL PRODUCTION. THIS LAND HAS THE SOIL QUALITY, GROWING SEASON, AND MOISTURE SUPPLY NEEDED TO PRODUCE SUSTAINED HIGH YIELDS. LAND MUST HAVE BEEN USED FOR IRRIGATED AGRICULTURAL PRODUCTION AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE

Figure 13 Excerpt from Map of Lake County Important Farmland 2006, California Department of Conservation, Department of Land Resource Protection, Farmland Mapping and Monitoring Program [41]

To further demonstrate the importance of the soils of this area, the table below shows the total estimated acreage of soils designated as prime farmland and the percentage of the total soils in Lake County for each map unit.

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[1] California Department of Conservation Map of Lake County Important Farmland 2006, Department of Land Resource Protection, Farmland Mapping and Monitoring Program

Prime Farmland in Upper Lake Valley				
Map Unit Symbol	Acres in Upper Lake Valley	Total Acres of Map Unit in Lake County	Percent of Total Acres of Map Unit found in Upper Lake Valley	Soil Series
124	562.8	1,550	36.30%	Cole Variant
158	2495.7	4,820	51.70%	Lupoyoma
233	1428.4	4,770	29.90%	Still Loam
234	616.8	1,770	34.80%	Still Gravelly Loam
238	975.5	1,120	87.10%	Tulelake silty clay loam, flooded
239	1418.6	2,610	54.40%	Tulelake silty clay loam, protected

The following discussion on each soil type was taken from the 1989 Lake County Soil Survey by U S Department of Agriculture, Soil Conservation Service. Soils that comprise 4 percent or more of the total acres are included in this discussion.

120 Bressa – Millsholm loams, 15 to 30 percent slopes – This map unit is on hills at elevations of 1,200 to 2,500 feet. This soil unit is comprised of about 45 percent Bressa loam and 35 percent Millsholm loam.

The Bressa soil is moderately deep well drained formed in material weathered from sandstone with a light brownish gray and pale brown loam surface layer to a depth of about 12 inches. Soil below this is light yellowish brown clay about 14 inches thick with fractured sandstone at a depth of 26 inches. Permeability is moderately slow. The percentage of organic matter for this component is 0.5 – 3 percent.

The Millsholm soil is shallow and well-drained. It formed in material weathered from sandstone or shale with a surface layer is brown loam about 3 inches thick and subsoil of pale brown clay loam about 8 inches thick. Fractured sandstone is at a depth of 11 inches. Permeability is moderate and soil reaction is moderately acidic to neutral.[42] The texture of this soil is medium textured loam. Percent of organic matter in this soil component is between 1 and 3 percent.

The Storie Index rating as an indicator of fertility for this soil is fair based on a nutrient level as a limitation.[43] Surface runoff for both soils is rapid and hazard of erosion is severe.[44]

158 Lupoyoma silt loam, protected, 0 to 2 percent slopes – This is a very deep, moderately well drained soil found on flood plains. It was formed in alluvium from mixed rock sources with brown silt loam to a depth of 31 inches with brown and very dark grayish brown silt loam to a depth of 84 inches. Permeability of this soil is slow to moderately slow. Soil reaction is slightly

[42] Ibid, page 430

[43] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 247

[44] Ibid, page 32

acid to neutral.[45] The texture of this soil is silt loam. Percent of organic matter in this soil is between 1 and 2 percent. The Storie Index rating for this soil classifies it as grade 1, excellent soils for a variety of crops and it is identified as one of the soil series in prime farmland by the US Department of Agriculture. Drainage and flooding are noted as limiting factors for this soil.[46]

163 Manzanita gravelly loam, 8 to 25 percent slopes - This very deep well drained soil formed in alluvium from mixed rock sources is on terraces at elevations of 1,350 to 1,600 feet. Typically, the surface layer is brown gravelly loam 7 inches thick. The upper 28 inches of the subsoil is reddish yellow gravelly clay loam, and the lower 25 inches is reddish yellow gravelly clay. Permeability of this soil is slow.[47] Soil reaction is moderately acidic to neutral.[48] The texture of this soil is clay loam. Percent of organic matter in this soil is less than 1 percent, unacceptably low fertility without addition of amendments for winegrapes.[49] The Storie Index rating as an indicator of fertility for this soil is poor based on nutrient level as a limitation.[50]

177 Millsholm – Bressa loams, 30 to 50 percent slopes – This map unit is found on hills. It is comprised of about 45 percent Millsholm loam and 35 percent Bressa loam

The Millsholm soil is shallow and well-drained. It formed in material weathered from sandstone or shale with a surface layer is brown loam about 9 inches thick and subsoil of pale brown clay loam about 6 inches thick with a subsoil layer of pale brown clay loam. Fractured sandstone is at a depth of 18 inches. Permeability is moderate and soil reaction is moderately acidic to neutral.[51] The texture of this soil is medium textured loam.

The Bressa soil is moderately deep well drained formed in material weathered from sandstone with a light brownish gray and pale brown loam surface layer to a depth of about 12 inches. Soil below this is light yellowish brown clay about 14 inches thick with fractured sandstone at a depth of 26 inches. Permeability is moderately slow. Soil reaction is moderately acidic to neutral. The texture of this soil is loam.

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[45] Ibid, page 60

[46] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 251

[47] Ibid, page 64

[48] Ibid, page 433

[49] Dr. Robert Pool, Cornell University, The Basics of Vineyard Site Evaluation and Selection, www.acerserver2.iagt.org/vll/learnmore.aspx

[50] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 251

[51] Ibid, page 430

Percent of organic matter in this soil is 1 to 3 percent for Millsholm, 0.5 to 3 percent for Bressa, ranging from marginal to the best range for soil fertility for winegrapes.[52] The Storie Index rating as an indicator of fertility for this soil is fair based on nutrient level as limitations.[53]

178 Millsholm - Bressa – Hopland association, 30 to 50 percent slopes - This map unit is on hills. The unit is about 35 percent Millsholm loam, 20 percent Bressa loam, and 15 percent Hopland loam.

The Millsholm soil is shallow and well-drained. It formed in material weathered from sandstone or shale. The surface layer is brown loam about 3 inches thick with subsoil that is pale brown clay loam about 8 inches thick. Fractured sandstone is at a depth of 11 inches. Permeability is moderate.

The Bressa soil is moderately deep well drained formed in material weathered from sandstone with a surface layer about 12 inches thick that is light brownish gray and pale brown loam. The subsoil is light yellowish brown clay about 14 inches thick with fractured sandstone at a depth of 26 inches. Permeability is moderately slow.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone. The surface layer is brown loam 6 inches in depth. The subsoil has about 9 inches of brown loam with a lower 19 inches of subsoil that is light brown clay loam. Soil reaction for this soil unit is moderately acidic to neutral. The textural class of the upper horizon of this soil is loam / clay loam.

Percent of organic matter in this soil is 1 to 3 percent for Millsholm, 0.5 to 3 percent for Bressa and 1 to 2 percent for Hopland[54], ranging from marginal to the best range for soil fertility for winegrapes.[55] The Storie Index rating as an indicator of fertility for all components for this soil unit are fair based on a nutrient level as a limitation.[56]

181 Neice - Sobrante - Hambright complex, 15 to 30 percent slope – This map unit is found on hills. It is comprised of about 40 percent Neice gravelly loam, 15 percent Sobrante loam, and 15 percent Hambright very gravelly loam with smaller areas of Millsholm soils.

The Neice soil is very deep and well drained and formed in material from metavolcanic basalt. The surface layer is yellowish red gravelly loam about 11 inches in depth. The subsoil has an

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[52] Dr. Robert Pool, Cornell University, The Basics of Vineyard Site Evaluation and Selection, www.acerserver2.iagt.org/vll/learnmore.aspx

[53] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 253

[54] Ibid, page 435

[55] Dr. Robert Pool, Cornell University, The Basics of Vineyard Site Evaluation and Selection, www.acerserver2.iagt.org/vll/learnmore.aspx

[56] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 253

upper layer about 9 inches in depth that is yellowish red gravelly clay loam and a lower layer 50 inches in depth of dark red very gravelly clay. Permeability of this soil is moderately slow. Organic matter in this soil is 1 to 2 percent and soil reaction is slightly acidic to neutral.

The Sobrante soil is moderately deep, and well drained, formed in material weathered from metavolcanic basalt. With a surface layer about 10 inches deep of reddish brown loam, the soil is underlain with an upper 11 inches of reddish brown loam and a lower 17 inches of reddish brown clay loam. Basalt is found at a depth of 38 inches with this soil. Permeability of this soil is moderate. Organic matter is 1 to 3 percent and soil reaction is moderately acidic to neutral.

Hambright soil is shallow and well drained. It is formed in material weathered from metavolcanic basalt with a 4 inch surface layer of reddish brown very gravelly loam and a 12 inch subsoil of reddish brown very gravelly loam underlain with basalt. Permeability of this soil is moderate.[57] The percent of organic matter is 2 to 8 percent. Soil reaction is slightly acidic to neutral.[58]

The weighted average Storie Index soil grade for this soil series is poor based on nutrient levels.[59]

233 Still loam, stratified substratum - This very deep well drained soil is on alluvial plains. It formed in alluvium derived from mixed rock sources, dominantly sandstone or shale. Slope is 0 to 2 percent. Permeability is slow to moderately slow. Soil reaction for Still loam is slightly acid to neutral.

Still loam is comprised of a surface layer of brown loam about 6 inches in depth with a brown clay loam subsoil about 30 inches thick. The upper 16 inches of the subsoil is stratified, brown clay loam and loam, with the lower part to a depth of 70 inches extremely gravelly loamy course sand. The textural class of this soil is loam. Percent of organic matter in this soil is 1 to 4 percent. This soil series is recognized as prime farmland by USDA. The Storie Index rating as an indicator of fertility for this soil is excellent with a limitation of flooding noted.[60]

234 Still Gravelly Loam – Still gravelly loam is very deep, well-drained soil found on alluvial plains. It formed in alluvium from mixed rock sources, mostly sandstone or shale. A 3 inch surface layer of brown gravelly loam sits over a subsoil of 36 inches of brown gravelly clay loam. Slopes range from 0 to 2 percent. Permeability is moderately slow. This soil series is recognized as prime farmland by USDA.[61]

[57] Ibid, page 76
[58] Ibid, pages 435 - 436
[59] Ibid, page 253
[60] Ibid, page 259
[61] Ibid, page 118

The textural class of this soil is gravelly. Soil reaction is slightly acid to neutral and percent of organic matter is 1 to 4 percent. The Storie Index rating for this soil unit is good with limitations of flooding and nutrient level noted.[62]

238 Tulelake silty clay loam, flooded – This is a very deep, poorly drained soil formed in alluvium derived from mixed rock sources. It is found in lake basins. Slope is 0 to 2 percent and elevation is 1,300 to 1,400 feet. With a surface layer of grayish brown silty clay loam to a depth of 10 inches thick, the subsoil to a depth of 77 inches is stratified, gray and light brownish gray silty clay loam and silty clay.

Permeability of this soil is slow and the soil is subject to frequent periods of flooding in winter and spring. The soil unit that is found in Tule Lake is artificially drained in spring and summer.[63] Soil reaction for this soil unit is moderately acid to slightly neutral.[64] The textural class of the upper horizon of this soil is silty clay loam, noncalcareous. Percent of organic matter in this soil is 1 to 3 percent. The Storie Index soil grade for this soil is poor with limitations listed for flooding and drainage.[65]

239 Tulelake silty clay loam, protected - This is a very deep, poorly drained soil formed in alluvium derived from mixed rock sources found in reclaimed lake basins. Slope is 0 to 2 percent and elevation is 1,300 to 1,400 feet. The surface layer is grayish brown silty clay loam to a depth of about 10 inches thick. The underlying 77 inches of subsoil is stratified, gray and light brownish gray silty clay loam and silty clay.

Permeability of this soil is slow.[66] Soil reaction moderately acid to slightly neutral.[67] The textural class of the upper horizon of this soil is silty clay loam, noncalcareous. Percent of organic matter in this soil is 1 to 3 percent. The Storie Index soil grade for this soil is fair with limitations listed for drainage.[68]

244 Wappo variant clay loam, 2 to 8 percent slopes – This soil is very deep, moderately well drained soil formed in alluvium from mixed rock sources and found on terraces at elevations of 1,400 to 1,650 feet. Yellowish red clay loam forms the surface layer at a depth of 4 inches thick. The upper 11 inches of subsoil is yellowish red clay and the lower 69 inches is yellowish red gravelly and very gravelly clay loam.

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[62] Ibid, page 259
[63] Ibid, page 1
[64] Ibid, page 442
[65] Ibid, page 260
[66] Ibid, page 121
[67] Ibid, page 442
[68] Ibid, page 260

Permeability of this soil is very slow. [69] Soil reaction moderately acid to slightly neutral.[70] The textural class of the upper horizon of this soil is clay loam, noncalcareous. Percent of organic matter in this soil is 1 to 2 percent. The Storie Index soil grade for this soil is poor with limitations listed for nutrient level and drainage.[71]

Importance to Viticulture

Soil is the medium in which plants develop and grow. The soil composition, depth, availability of nutrients to vines, water retention, and drainage are key components of vine and fruit development.

Most of the vineyards currently found in the proposed AVA are planted on Still –Lupoyoma soils. Presence of vineyards in this area is probably due to the gentler terrain relative to the soils of the Millsholm-Skyhigh-Bressa general map unit and better drainage relative to the soils of the Tulelake - Fluvaquentic – Haplawuolls map unit.

Still – Lupoyoma soils including Lupoyoma silt loam protected (series 158), Still loam (series 233), and Still gravelly loam (series 234) are the main soils found in the proposed area from this general map unit. They are deep and moderately well to well-drained soils formed in alluvium from mixed sources. All are well suited to viticulture. Lupoyoma silt loam protected soils are very deep, moderately well drained soil. Drainage is the main concern for this soil series. Still loam soils are very deep well drained soils. The limiting conditions for these soils are also drainage and in the case of Still gravelly loam, series 234, nutrient level.

Tulelake - Fluvaquentic – Haplawuolls soils, series 238 and 239 are found predominantly in the Tule Lake area. Drainage is the primary limiting factor for these soils. Where this can be mitigated, these soils could provide suitable growing are for vineyards.

Numerous soil taxonomic units make up the Millsholm-Skyhigh-Bressa general map unit in the proposed AVA. Of these, a large proportion is Millsholm-Bressa-Hopland association, 30 to 50 percent slopes and Bressa – Millsholm loams, 15 to 30 percent slopes. Sleeper series soil is also found in this general map unit, and all three of these soils are limited by slow permeability and erosion hazard.

Scholarly and scientific studies of viticulture further support the importance of soil as an integral component in the production of quality winegrapes. In the book Viticulture and Environment, John Gladstones notes, "Despite a lack of rigorous scientific proof, and an acknowledged dominant control over winegrape qualities by climate, soil type remains very important in the choice of vine-growing sites within a region."[72] Soil depth and fertility are important

[69] Ibid, page 124
[70] Ibid, page 443
[71] Ibid, page 260
[72] John Gladstones, Viticulture and Environment, Wine titles, 1992, page 41

considerations in viticulture. The depth of soils in the Still – Lupoyoma general map unit and the Tulelake - Fluvaquentic – Haplawuolls general map unit support deep root growth although the soil requires amendments for good fertility. According to the book General Viticulture, "Varieties of *Vitis Vinifera* are deep-rooted plants that fully explore the soil to 6 to 10 feet or more if root penetration is not obstructed by hardpan, impervious clay substratum, toxic concentration of salts, or a free water table[73]". While deep soil is important, this same book goes on to note, "The quality of fruit is better, although yields are usually lower, on soils of lower fertility or soils limited in depth by hardpan, rocks, or clay substrata[74] Soils in the Millsholm – Skyhigh – Bressa general map unit fit this description since they have limited depth to support root growth.

Boundary Discussion – Soils

Soils in Other Lake County AVAs

Soils in the proposed area differ from soils in the AVAs to the east and south of the proposed area. The map shown below is excerpted from the Lake County American Viticultural Areas map found on the Lake County Winegrape Commission website (www.lakecountywinegrape.org), and is included here to show the location of AVAs to the east and south of the proposed area.

[73] A J Winkler, James A Cook, W M Kliewer, Lloyd A Lider, General Viticulture University of California Press, 1962, p 71

[74] .Ibid, p 71

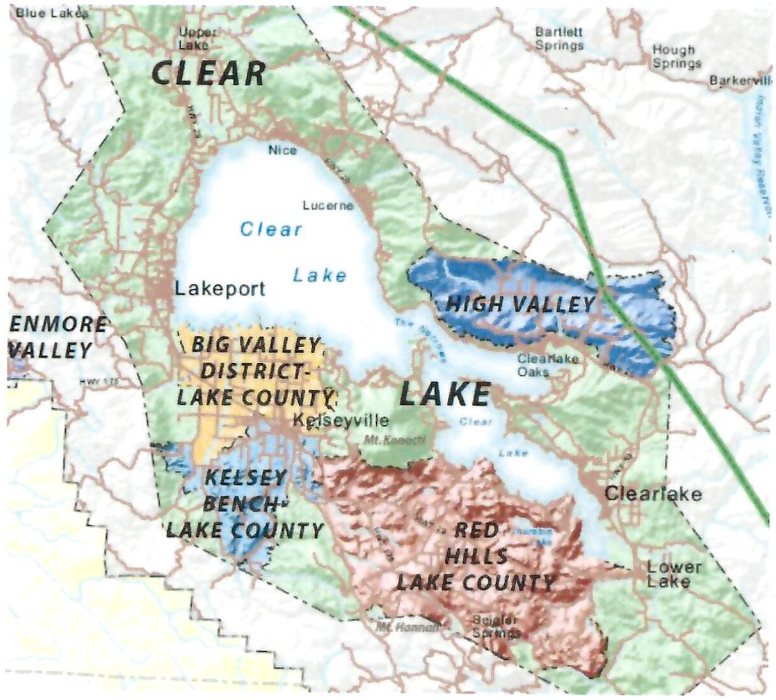

Figure 14 Section of the Lake County American Viticultural Area map from the Lake County Winegrape Commission. The proposed area is located where the word Clear appears at the north end of the lake.

The Big Valley District covers more than 11,000 acres of level valley floor and is located to the south of the proposed area. The soils of this area are predominantly Cole-Clear Lake Variant – Clear Lake general soil map unit. These soils are deep soils but are poorly drained clay loam and clay.

The High Valley AVA, located to the east of the proposed area, is an east-west transverse valley surrounded by mountains. Soil types found here include two general types – those formed from weathered volcanics and those formed in sandstone, shale, or phyllitic rocks. The valley floor soils are predominantly Wolfcreek loam, a deep well drained soil comprised of clay to sandy loam. While this soil series is part of the Still – Lupoyoma general map unit, the texture and composition of the soil is different from the soils of the silty loam soils in the proposed area. Sanhedrin, Squawrock, and Mayacama soils are found on the hillsides that form the boundaries to the south and west of the valley. Konocti series soils are found in the eastern half of the AVA and comprised of rocky to cobbly loams, shallow to very deep and well drained.

The Kelsey Bench – Lake County AVA sits to the south and east of the Big Valley District. Soils that form this AVA can be characterized as three main general map units, Manzanita-Wappo-Forbesville (MWF), Phipps-Bally (PB), and Millsholm-Skyhigh-Bressa (MSB). The majority of planted acreage in this area is on Forbesville soils of the MWF general map unit. These soils are very deep soils found on terraces consisting of moderately drained to well drained loam. Forbesville soils are also different in texture and composition from the Still – Lupoyoma soils of the proposed area with Forbesville soils being characterized as loam rather than silty loam.

Finally, the Red Hills – Lake County AVA sits to the south of Kelsey Bench and Big Valley in the Clear Lake volcanics. Soils in this AVA are known for their volcanic origins, deep red color, and obsidian content. General map units found in this area are Collayomi-Aiken-Whispering (CAW), Glenview-Bottlerock-Arrowhead (GBA), and Konocti – Benridge (KB). The texture of these soils are characterized as cobbly loam to gravelly loam with CAW and KB soils being found on andesite, basalt, and dacite hills and mountains.

Soils Lying Outside the Boundaries of Proposed Area

Soil survey maps for the Upper Lake Quadrangle, Lakeport Quadrangle, Bartlett Mountain Quadrangle, and Lucerne Quadrangle were examined to identify soil series outside of the boundaries of the proposed area shown in the chart in Figure 15.

Figure 15 - Soils to North, East, South, & West of Upper Lake Valley Boundaries

Soil Series	**Boundary Direction**	**Series Name**	**Slope**	**Acres of This Series in Upper Lake Valley**	**General Map Unit**
169	east	Maymen-Etsel-Snook complex	30% - 75%	102.1	Maymen-Etsel
170	east	Maymen - Etsel - Speaker association	30% - 50%	14.8	Maymen-Etsel
171	east	Maymen - Hopland - Etsel association	15% - 50%	12.1	Maymen-Etsel
182	east	Neice - Sobrante - Hambright complex	30% - 75%	62.3	Sobrante - Guenoc - Hambright
224	east	Speaker - Marpa - Sanhedrin gravelly loams	30% - 50%	256.4	Sanhedrin - Speaker - Kekawaka
226	east	Speaker - Maymen - Marpa association	50% - 75%	26.7	Sanhedrin - Speaker - Kekawaka
170	north	Maymen - Etsel - Speaker association	30% - 50%	14.8	Maymen-Etsel
171	north	Maymen - Hopland - Etsel association	15% - 50%	12.1	Maymen-Etsel
173	north	Maymen-Hopland-Mayacama	30% - 50%	591.1	Maymen-Etsel

202	north	Sanhedrin - Kekawaka - Speaker complex	30% - 50%	0	Sanhedrin - Speaker - Kekawaka
224	north	Speaker - Marpa - Sanhedrin gravelly loams	30% - 50%	256.4	Sanhedrin - Speaker - Kekawaka
226	north	Speaker - Maymen - Marpa association	50% - 75%	26.7	Sanhedrin - Speaker - Kekawaka
169	west	Maymen-Etsel-Snook complex	30% - 75%	102.1	Maymen-Etsel
173	west	Maymen-Hopland-Mayacama	30% - 50%	591.1	Maymen-Etsel
174	west	Mayman-Hopland-Mayacama	50% - 75%	263.8	Maymen-Etsel
179	west	Millsholm -Squawrock - Pomo complex	30% - 50%	79.8	Millsholm-Skyhigh-Bressa
198	west	Pomo - Bressa loams	15% - 50%	136.3	Millsholm-Skyhigh-Bressa
200	west	Rock outcrop - Etsel - Snook complex	50% - 80%	26.3	Maymen-Etsel
214	west	Sleeper variant - Sleeper loams	15% - 30%	539.3	Millsholm-Skyhigh-Bressa
215	west	Sleeper variant - Sleeper loams	30% - 50%	198.9	Millsholm-Skyhigh-Bressa
256	south	water - Clear Lake		224.6	water

<u>North</u>

The northern boundary for this area follows the 1,600 foot elevation line and Mendocino National Forrest boundary. Elevations rise with steeper slopes. Soils found to the north include series 170, 171, and 173 of the Maymen –Etsel general map unit, and series 202, 224, and 226 of the Sanhedrin - Speaker –Kekawaka map unit. These soil units make up about 5 percent of the soils of the proposed area. All are found on mountains or hills with steep slopes of as much as 75 percent grade with hazard of erosion rated as severe and classified as mesic temperature regime. The soils in the general map unit Maymen-Etsel are shallow, are derived from different parent materials, and have outcroppings of large stones including graywackes and sandstone. These soils are distinctly different from the soils of the level valley floors where soils are predominately very deep well drained silty loams, of the thermic soil temperature regime with parent material formed in alluvium from mixed sources.

East

The eastern boundary of the Upper Lake Valley follows the 1,600 foot elevation line south along the east side of Middle Creek Valley, south along the east side of Clover Valley, and along the same elevation line around Nice. Hogback Ridge lies between Middle Creek Valley and Clover Creek Valley. The Mendocino National Forest and mountains of the Coastal Mountain Range lie to the east. The typography of the land is mountainous with elevations rising to 2,700 feet and higher. Soils found to the east include series 169, 170 and 171 of the Maymen –Etsel general map unit, series 182 of the Sobrante – Guenoc- Hambright general map unit, and series 224 and 226 of the Sanhedrin - Speaker –Kekawaka map unit. These soil units make up less than 3 percent of the soils of the proposed area. All are found on mountains or hills with steep slopes of as much as 75 percent grade and hazard of erosion rated as severe. All but series 182 were formed in sandstone and shale. Series 182 was formed in metavolcanic basalt. These soils are distinctly different from the soils of the level valley floors where soils are predominately very deep well drained silty loams with hazards of erosion characterized as slight and parent materials formed in alluvium from mixed sources.

South

The southern boundary line of the proposed area follows the shoreline of Clear Lake.

West

The western boundary line for the proposed area starts at the shores of Clear Lake along the road known locally as Lafferty Road to State Highway 29, proceeding north and then west to the 1,600 foot elevation line. The soils on the west side of Highway 29 are series 214 and 215 part of the Millsholm – Skyhigh – Bressa general soil map unit. Soils of these two series are found on hills and make up about 4 percent of the proposed area. Both are deep, well drained soils formed in sandstone, shale, or siltstone.

The Mayacamas Mountains with Franciscan Formation soils are found to the west of the 1,600 foot elevation line western boundary of the proposed area. Soils are of the Maymen – Etsel and Millsholm – Skyhigh – Bressa (MSB) general soil map units. Maymen-Etsel (ME) are also shallow, are derived mainly from sandstone parent materials, and have outcroppings of large stones including graywackes and sandstone. Millsholm – Skyhigh - Bressa soils are shallow to moderately deep soils on hills and mountains. They formed in sandstone, shale, and siltstone. Both of these map units are classified in the mesic soil temperature regime.

Both MSB and ME soils are distinctly different from the soils of the level valley floors where most soils are predominately very deep well drained silty loams, of the thermic soil temperature regime with parent material formed in alluvium from mixed sources.

Climate

Climate is a distinguishing feature of the proposed Upper Lake Valley. Located between the Mayacamas Mountains on the west and the Coastal Mountain Range to the east with Clear Lake to the south, protecting the area from the marine influence of the coastal areas while bringing cooling winds from the Lake in the summer. The unique microclimate with cold wet winters and hot, dry summers is a special wine growing area. According to local growers, the proposed area which located at the north end of Clear Lake is like a citrus belt with spring bud break occurring two weeks earlier than other areas in Lake County. Ample rainfall, a long frost free growing season, winds to provide air movement and cooling for vineyards on hot summer days, and growing degree-days will all be cited to demonstrate the unique features of this area and suitability for viticulture.

Rainfall - Rainfall in the proposed Upper Lake Valley area is significantly different than surrounding areas. Precipitation varies greatly over Lake County due to the rapid changes in topography between the Mayacamas Mountains to the west and the lower elevations of the Bachelor, Middle Creek, and Clover Creek Valleys. According to a study by Earth Science Associates, precipitation increases as one goes north along the Middle Creek Valley.[75] The table below shows the rainfall totals recorded in the Upper Lake station for the years of 2011 through 2016. (Data for 2013 was unavailable at that station.) Average rainfall for those years was 33.96 inches, comparable to the average rainfall recorded by Western Region Climate Center (wrcc@dri.edu) for the period of January 1, 1893 through November 12, 2006 when the average rainfall for Upper Lake was recorded at 34.09 inches.

Rainfall	
Western Weather Group for Lake County Winegrape Commission	
Upper Lake Station (UPL)	
Year	**Inches of Precipitation**
2016	41.43
2015	20.53
2014	38.34
2013	Unavailable
2012	41.08
2011	28.43

[75] Earth Science Associates, Upper Lake Groundwater Investigation for Lake County Flood Control and Water Conservation District, January, 1978, page IV-1

Importance to Viticulture

Annual rainfall plays a critical role in ensuring sufficient water for irrigation of grapes and recharge of the underlying groundwater. Wine grapes require sufficient water during the growing season to produce and ripen the fruit, with an average of 8 to 11 acre inches per year based on a study of winegrape production in Lake County.[76]

Recharge of the groundwater basin of the proposed area is from both rainfall and surface water flow into the active channels of Middle Creek, Alley Creek, and Clover Creek. According to Earth Science Associates, demand for groundwater from wells has never exhausted the capacity of the Upper Lake groundwater basin.[77]

Boundary Discussion

Two sources of information were consulted to compare rainfall in the proposed area with areas outside of the boundaries. California Groundwater Bulletin 118 includes precipitation ranges for each groundwater basin. The table below shows the predicted ranges for basins located in areas of Lake County to the south, east, west, and north. The predicted rainfall for the Upper Lake Basin which contains the proposed area is significantly higher than rainfall predicted for basins to the west, south, and east but less than the predicted rainfall for Gravelly Valley, located north of the proposed area.

Annual Precipitation Bulletin 118		
Basin	**Inches of Rain**	**Direction from Proposed Area**
Upper Lake Basin	35 - 43	
Big Valley Basin	22 - 35	South
High Valley	27 - 35	East
Scotts Valley	31 - 35	West
Gravelly Valley	49	North

76 Ryan Keiffer, Agricultural Technician, UCCE Mendocino, Dr. Broc Zoller, PCA, Kelseyville, Vineyard Water Use in Lake County, California, December 1, 2014

77 Earth Science Associates, Upper Lake Groundwater Investigation for Lake County Flood Control and Water Conservation District, January, 1978, page V-5

Data was also gathered from Western Weather for stations in the proposed area (UPL), Scotts Valley (SV), and three stations in the Big Valley District – Bell Hill West (BHW), Kelseyville (KEL), and Kelseyville South (SML) for the years of 2012 through 2016. While data for some stations was incomplete during this timeframe, a clear pattern reveals that the annual rainfall recorded at the Upper Lake station is higher than the rainfall recorded in weather stations to the south at the three Big Valley District stations and in Scotts Valley to the southwest of the proposed area.

Rainfall Comparisons

Western Weather Group for Lake County Winegrape Commission					
Year	**UPL**	**SV**	**BH W**	**KEL**	**SML**
2016	41.43	40.9	21.22	25.4 9	INC
2015	20.53	20.21	19.72	19.8	15.09
2014	38.34	34.75	33.41	INC	28.23
2013	INC	INC	INC	INC	14.71
2012	41.08	38.54	27.45	25.7 4	31.72

This is further confirmed by average rainfall amounts recorded for Lakeport that sits between Upper Lake and the Big Valley area. For the years between January 1, 1920 and June 20, 2002, average annual rainfall for Lakeport was 28.36 inches. This was several inches below the average rainfall of 34.09 inches recorded for Upper Lake over the period of January 1, 1893 and December 12, 2006.[78]

Frost Free Period – The growing season, broadly defined as the number of days between the last frost event in the spring and first frost event in the fall, is an important indicator for successful winegrape cultivation. Based on an examination of weather data from Western Weather at the Upper Lake Station for the growing season for winegrapes for 2011 through 2016, the frost free period for the proposed area varies between a low of 172 days and a high of 232 days. This data

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78 Western Regional Climate Center, Period of Record Monthly Climate Summary for Lakeport, CA and Upper Lake, CA, www.wrcc@dri.edu

demonstrates that the proposed area is well within the range of frost free days to be a suitable area for viticulture.

Frost Free Days, Upper Lake Valley		
Median	Max	Min
202	232	172

Last Spring Frost, Upper Lake Valley		
Median	Maximum	Minimum
11-Apr	1-May	18-Mar

First Fall Frost, Upper Lake Valley		
Median	Maximum	Minimum
3-Nov	17-Nov	5-Oct

Importance to Viticulture

The length of the growing season calculated by totaling the number of days between last spring frost and first fall frost therefore impacts the selection of varieties to be planted and the successful production of the crop.

Frost free periods, also known as the growing season, are important to viticulture for two reasons. Frost events can produce significant damage or prevent the vines from developing the necessary sugars for successful wine production. Spring frosts that occur after bud break can cause the tender shoots and forming grape clusters to burn and die resulting in crop loss and lower yields. Early frost in the fall impacts the vine's ability to ripen the grapes to the BRIX levels that produce high quality wine. Figure 16 further demonstrates the importance of the frost free period or growing season on the annual cycle of development and ripening of winegrapes. [79]

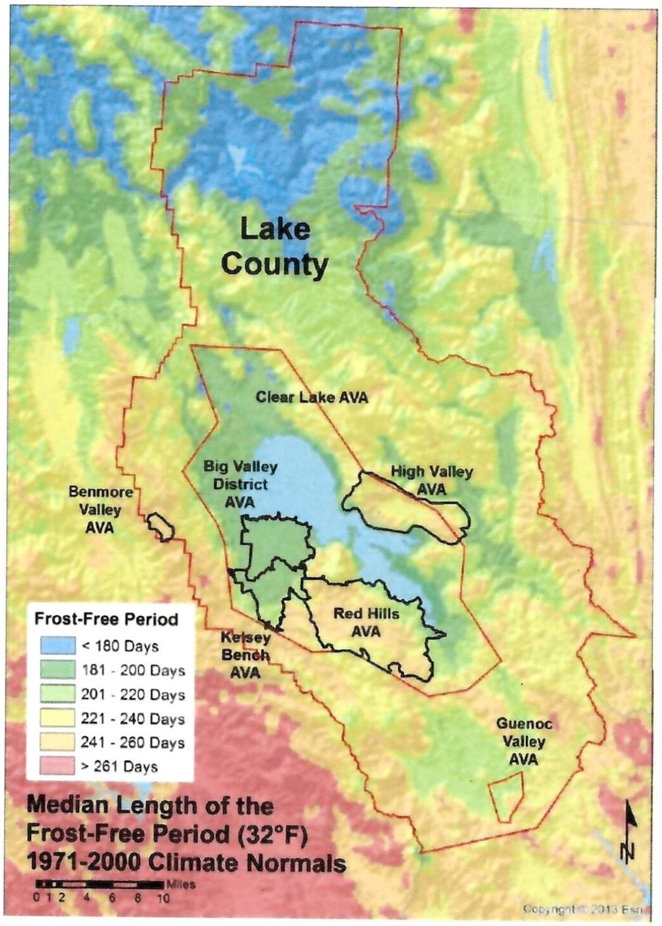
[79] Gregory V Jones, PhD, Climate Characteristics for Winegrape Production in Lake County California, report for Lake County Winegrape Commission, www.lakecountywinegrape.org, 2014, page 5

		VEGETATION DEVELOPMENT (FEB, MAR, APR, MAY)	BERRY DEVELOPMENT (JUN, JUL, AUG, SEP, OCT)	DORMANT STAGE (NOV, DEC, JAN)
	Stages	Sap Bleeding; Bud Break; Bloom	Berry Set; Berry Growth; Véraison; Maturation/Harvest	Leaf Fall; Full Dormancy
Temperature	Negative Influence	Tmin < 28°F; Prolonged Period with Tmax < 50°F; Abnormally Cool during Bloom	Heat Stress with Tmax > 95°F	Tmin < 23 to -4°F Damage to Latent Buds (depending on cultivar)
Temperature	Positive Influence	Tavg > 50°F Favors Plant Growth	Sufficient Heat Accumulation to drive Berry Growth; Appropriate Diurnal Range to Synthesize Tannins and Sugars	Sufficient Chilling Units to insure Full Dormancy
Insolation	Low Amount	Cloudy/Cool/Wet - Coulure Failure to Flower Completely		
Insolation	High Amount	Good for Flower Differentiation and Berry Set	Good for Accumulation of Sugars	
Wind	Negative Influence	Breaks Small Branches, Tendrils, Shoots, etc.	Dessicates the Berries	
Precipitation	Wet Periods	Reduces or Retards Bloom	Promotes Fungus and Diseases; Dillutes Berries	Necessary for Soil Moisture Recharge
Precipitation	Dry Periods		Favors Optimum Photosynthesis; Favors Optimum Ripening and Balance	
Precipitation	Thunderstorms Heavy Rain or Hail	Damages Young Shoots, Tendrils, Leaves, Flowers and Berries	Promotes Fungus and Diseases; Can Burst Grape Clusters - Ruin Crop	Heavy Rain Events can lead to Soil Erosion
Soil Moisture*	Positive Influence	Soil Moisture Recharge important for Early Season Growth	Adequate Soil Moisture Redues Heat Stress	
Soil Moisture*	Negative Influence	High Soil Moisture Drives too much Vegetative Growth	High Soil Moisture Limits Ripening and Delays Leaf Fall	

Figure 16 Weather and climate influences on grapevine development and phenological growth stages. (Crespin, 1987; Jones, 1997; Jones et al, 2012)

Boundary Discussion

The figure below shows the frost free period for the seven Lake County AVA's.[80]



AVA Name	Median	Max	Min
Big Valley District	195	228	190
Kelsey Bench	198	227	192
Clear Lake	200	260	174
Guenoc Valley	216	261	211
High Valley	236	255	190
Red Hills	241	255	194
Benmore Valley	248	250	243

Figure 20 – Lake County median length of the frost-free period (between the median last spring and first fall dates with 32°F; 1971-2000 Climate Normals) with the seven regional AVAs. (Data Source: Daly et al. 2008). The table on the right represents the median, maximum, and minimum values for the seven AVAs, sorted by the shortest to longest median values.

Figure 17 Identified as Figure 20 above, the frost-free period chart taken from Climate Characteristics for Winegrape Production in Lake County, CA

Data from this study when compared with data for the proposed area demonstrates that the frost free period of the proposed area is distinctly different from surrounding AVAs in Lake County. The chart below shows that the proposed Upper Lake Valley area has significantly fewer frost free days than the High Valley AVA to the east or the Benmore Valley AVA to the west, but has a longer frost free period than the Big Valley District to the south.

[80] Ibid, page 29

Comparison of Frost Free Days				
Direction	AVA Name	Median	Max	Min
	Upper Lake Valley	202	232	172
North	None			
West	Benmore Valley	248	250	243
South	Big Valley District	195	228	190
East	High Valley	236	255	190

Data from the same climate study was also compared for the date of the last spring and first fall frost dates. The proposed area's median last spring frost date was May 1st while the High Valley AVA to the east had a median last spring frost date of April 23rd, Benmore Valley to the west, April 7th, and Big Valley District to the south, April 20th.

Comparison of Last Spring Frost				
Direction	AVA Name	Median	Max	Min
	Upper Lake Valley	11-Apr	1-May	18-Mar
North	None			
West	Benmore Valley	3-Apr	7-Apr	2-Apr
South	Big Valley District	18-Apr	20-Apr	4-Apr
East	High Valley	2-Apr	23-Apr	23-Mar

Figure 18 Last spring frost dates for Upper Lake Valley (data from the Upper Lake Station for years 2011 through 2016) compared with data for AVAs to the west, south, and east (1971 – 2000 Climate Normals)[81].

A similar pattern of differences can be observed in looking at the median first fall frost dates for the same areas.

[81] Ibid, page 25

Comparison of First Fall Frost				
Direction	AVA Name	Median	Max	Min
	Upper Lake Valley	3-Nov	17-Nov	5-Oct
North	None			
West	Benmore Valley	8-Dec	8-Dec	6-Dec
South	Big Valley District	30-Oct	18-Nov	27-Oct
East	High Valley	25-Nov	4-Dec	28-Oct

Figure 19 First fall frost dates for Upper Lake Valley (data from Upper Lake Station for years 2011 – 2016) compared to first fall dates for AVAs to the west, south, and east (1971 – 2000 Climate Normals).[82]

Wind Characteristics - Lake County's inland location and protection by mountain ranges results in local meteorological effects playing a more important role in creating Lake County's microclimates and accounts for the differences between various areas than in other coastal regions. Winds develop as the result of temperature differentials. Temperature gradients due to differences in elevation generate mountain-valley winds and water –land temperature differentials generate lake-land winds. This material is based on a discussion found in the Red Hills Viticultural Area Petition dated August 27, 2001.[83]

The winds in the proposed area are influenced by the mountains that lie to the west, north, and east, and Clear Lake to the south. Winds in the area are predominately from the SSE or N direction in the daytime. The wind speeds are lower than many other parts of Lake County, and come either from the mountains to the north or the lake to the south. Winds at night very low speed and are mostly from the N, moving the cool nighttime air southward. The winds in the proposed area are calm only 2.23% of the time during the daytime hours and 3.04% of the time during nighttime hours.

The wind rose diagrams below depict the daytime and nighttime winds for the proposed area.[84]

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[82] Ibid, page 27

[83] Sara Schorske, Red Hills Viticultural Area Petition, (August 27, 2001) pages 15, 16

[84] Gregory V Jones, PhD, Climate Characteristics for Winegrape Production in Lake County California, report for Lake County Winegrape Commission, www.lakecountywinegrape.org, 2014, pages 18 & 19

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Upper Lake
Beginning - 1/01/2008 08:00 Ending - 12/31/2013 20:00 (Banded)

	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	13.15	0.00	0.00	0.00	0.00	13.15
NNE	5.46	0.00	0.00	0.00	0.00	5.46
NE	1.24	0.00	0.00	0.00	0.00	1.24
ENE	1.74	0.00	0.00	0.00	0.00	1.74
E	1.49	0.00	0.00	0.00	0.00	1.49
ESE	2.98	1.49	0.00	0.00	0.00	4.47
SE	5.96	4.22	0.50	0.00	0.00	10.67
SSE	7.44	2.73	0.00	0.00	0.00	10.17
S	13.65	0.50	0.00	0.00	0.00	14.14
SSW	7.20	0.74	0.00	0.00	0.00	7.94
SW	2.98	0.25	0.00	0.00	0.00	3.23
WSW	2.23	0.99	0.00	0.00	0.00	3.23
W	4.47	0.50	0.50	0.00	0.00	5.46
WNW	1.99	2.23	0.25	0.00	0.00	4.47
NW	5.46	0.00	0.00	0.00	0.00	5.46
NNW	5.46	0.00	0.00	0.00	0.00	5.46
Total	82.88	13.65	1.24	0.00	0.00	97.77 % Winds
						2.23 % Calm
						100.00 % Total

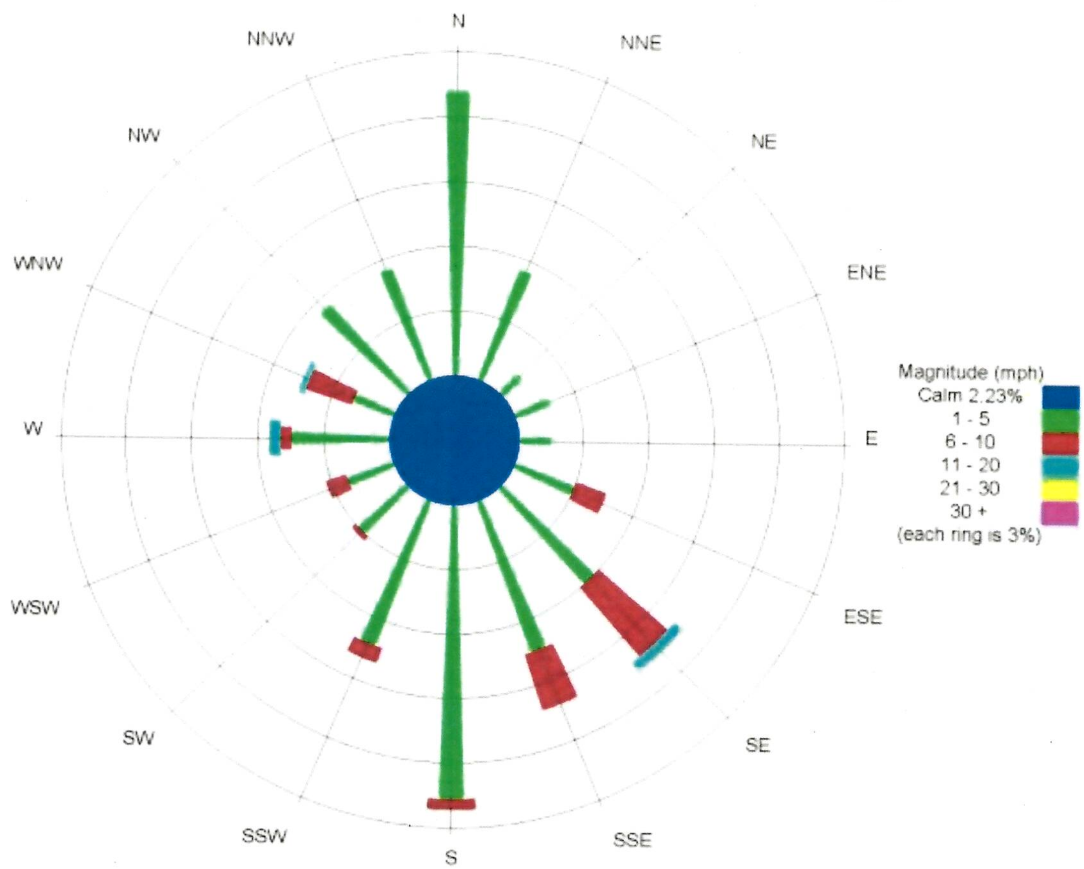

Figure 20 Daytime (8AM to 8PM) wind frequencies and wind rose diagram by direction for Upper Lake Station for 2008 - 2013 managed by Western Weather Group.

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Upper Lake
Beginning - 1/01/2008 20:00 Ending - 12/31/2013 08:00 (Banded)

	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	37.72	0.00	0.00	0.00	0.00	37.72
NNE	9.11	0.00	0.00	0.00	0.00	9.11
NE	2.78	0.00	0.00	0.00	0.00	2.78
ENE	1.27	0.00	0.00	0.00	0.00	1.27
E	1.77	0.00	0.00	0.00	0.00	1.77
ESE	2.28	1.77	0.00	0.00	0.00	4.05
SE	2.53	4.05	0.51	0.00	0.00	7.09
SSE	0.25	0.51	0.25	0.00	0.00	1.01
S	2.03	0.25	0.00	0.00	0.00	2.28
SSW	1.01	0.25	0.00	0.00	0.00	1.27
SW	1.01	0.00	0.00	0.00	0.00	1.01
WSW	0.76	0.00	0.00	0.00	0.00	0.76
W	2.78	0.00	0.25	0.00	0.00	3.04
WNW	3.29	0.25	0.00	0.00	0.00	3.54
NW	5.82	0.00	0.00	0.00	0.00	5.82
NNW	14.43	0.00	0.00	0.00	0.00	14.43
Total	88.86	7.09	1.01	0.00	0.00	96.96 % Winds
						3.04 % Calm
						100.00 % Total

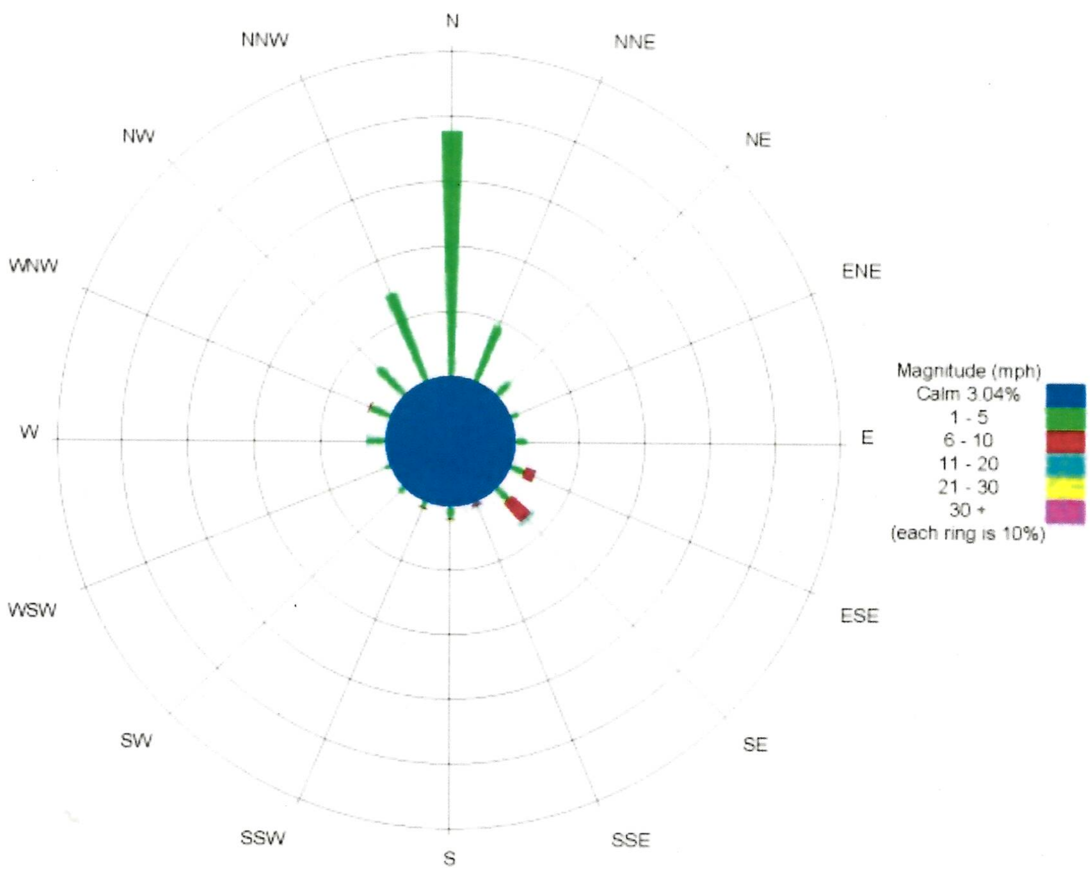

Figure 21 Nighttime (8PM - 8AM) wind frequencies and wind rose diagram by direction and speed for Upper Lake Station during 2008 - 2013, managed by Western Weather Group

Importance to Viticulture

Air movement plays a key role in preventing mildew and other pests in the vineyard. Combined with the significant swings in high and low temperatures in the growing season, air movement keeps the berries and canopy cool and dry. In Lake County, this translates to a lesser need for application of pesticides than in other areas.

Boundary Discussion

Wind characteristics in different locations in Lake County are quite complex and spatially variable due to the landscape. Figure 22 below has daytime wind roses for the four stations in different locations in the County. Figure 23 that follows has nighttime wind roses for the same four stations.[85] Guenoc Valley AVA is located southeast of the proposed area in the southern part of Lake County. Kelseyville, located in the Big Valley District is south of the proposed area on the western shore of Clear Lake. The Red Hills AVA lies to the west and south of the proposed area and the Big Valley District (BVD in the Mayacamas Mountains. Elevations are considerably higher in the Red Hills than any of the other three areas.

Guenoc Valley has the highest frequency of calm days at almost 11% compared to just over 2% for Upper Lake. A similar phenomenon can be seen at night where calm nights occur 37% of the time. Wind direction for Guenoc Valley is most commonly SW to SSW. Again, this is remarkably different from the proposed area where calm nights occur just over 3% of the time and general wind daytime wind direction is SSE or N and nighttime direction is from the north.

Wind speeds are generally higher for both daytime and nighttime in the Big Valley District and the Red Hills when compared to both the proposed area and Guenoc Valley. Daytime winds in Kelseyville (BVD) come from almost all directions with more winds from the S-SSE, ENE, and W. Wind direction at night come more from the ENE to SSE direction with generally lower wind speeds.

Winds in the Red Hills are generally moderately stronger during the daytime with NE to E and W directions. Nighttime winds are more commonly W-WSW and SE. For the Red Hills station winds tend to be moderately stronger during the daytime with NE to E and W directions most common, while at night winds tend to be more commonly from the W-WSW and SE. This is different than winds in the proposed area which are generally from the S-SE or N directions during the daytime and N direction at night.

Wind roses for each of the areas is shown in the figures below. To view enlarged versions for Guenoc Valley, Red Hills, and Kelseyville daytime and nighttime wind diagrams, see Appendix Exhibits 22 through 27, pages 84 - 89 in the Appendix to this petition.

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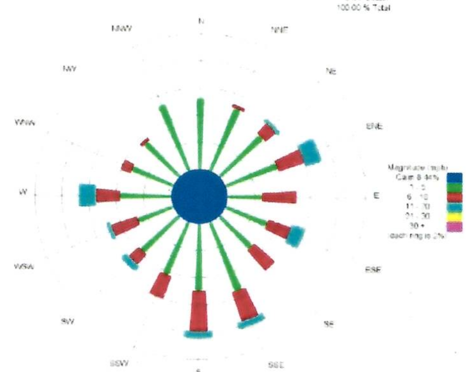
[85] Ibid, pages 18 & 19

a) Kelseyville

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Kelseyville
Beginning - 1/01/2008 08:00 Ending - 12/31/2013 20:00 (Banded)

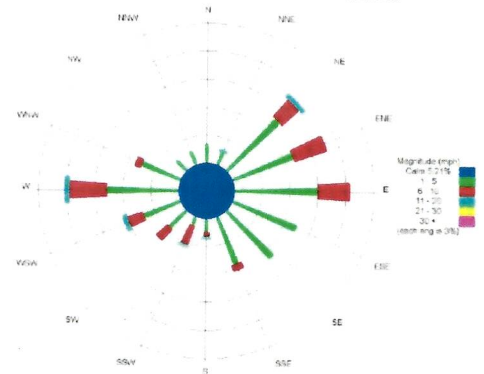
	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	5.21	0.00	0.00	0.00	0.00	5.21
NNE	4.96	0.25	0.00	0.00	0.00	5.21
NE	4.22	0.99	0.25	0.00	0.00	5.46
ENE	3.97	1.99	1.24	0.00	0.00	7.20
E	2.48	2.48	0.00	0.00	0.00	4.96
ESE	3.23	1.74	0.99	0.00	0.00	5.96
SE	3.23	1.99	0.00	0.00	0.00	5.21
SSE	5.46	2.23	0.50	0.00	0.00	8.19
S	4.96	2.98	0.50	0.00	0.00	8.44
SSW	4.22	1.74	0.00	0.00	0.00	5.96
SW	3.72	0.99	0.50	0.00	0.00	5.21
WSW	2.73	1.99	0.25	0.00	0.00	4.96
W	3.72	1.74	1.24	0.00	0.00	6.70
WNW	3.23	0.74	0.00	0.00	0.00	3.97
NW	3.47	0.25	0.00	0.00	0.00	3.72
NNW	5.21	0.00	0.00	0.00	0.00	5.21
Total	64.02	22.08	5.46	0.00	0.00	91.56 % Winds
						8.44 % Calm
						100.00 % Total



b) Red Hills

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Red Hills
Beginning - 1/01/2008 08:00 Ending - 12/31/2013 20:00 (Banded)

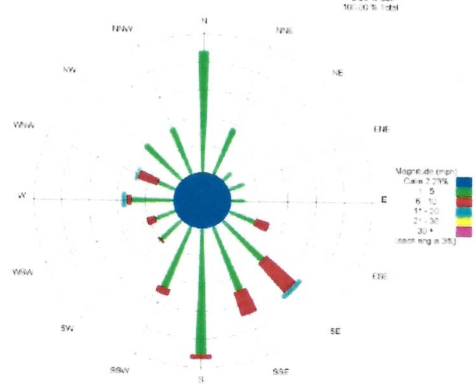
	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	1.99	0.00	0.00	0.00	0.00	1.99
NNE	1.49	0.00	0.25	0.00	0.00	1.74
NE	7.69	2.48	0.50	0.00	0.00	10.67
ENE	6.95	3.72	0.00	0.00	0.00	10.67
E	8.93	3.47	0.00	0.00	0.00	12.41
ESE	7.44	0.00	0.00	0.00	0.00	7.44
SE	6.95	0.00	0.00	0.00	0.00	6.95
SSE	5.46	0.74	0.00	0.00	0.00	6.20
S	1.49	0.50	0.25	0.00	0.00	2.23
SSW	0.99	2.23	0.25	0.00	0.00	3.47
SW	2.48	1.74	0.00	0.00	0.00	4.22
WSW	4.22	1.74	0.50	0.00	0.00	6.45
W	7.69	3.97	0.50	0.00	0.00	12.16
WNW	4.47	0.74	0.00	0.00	0.00	5.21
NW	1.49	0.00	0.00	0.00	0.00	1.49
NNW	1.49	0.00	0.00	0.00	0.00	1.49
Total	71.22	21.34	2.23	0.00	0.00	94.79 % Winds
						5.21 % Calm
						100.00 % Total



c) Upper Lake

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Upper Lake
Beginning 1/01/2008 08:00 Ending 12/31/2013 20:00 (Banded)

	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	13.15	0.00	0.00	0.00	0.00	13.15
NNE	5.46	0.00	0.00	0.00	0.00	5.46
NE	1.24	0.00	0.00	0.00	0.00	1.24
ENE	1.74	0.00	0.00	0.00	0.00	1.74
E	1.49	0.00	0.00	0.00	0.00	1.49
ESE	2.98	1.49	0.00	0.00	0.00	4.47
SE	5.96	4.22	0.50	0.00	0.00	10.67
SSE	7.44	2.73	0.00	0.00	0.00	10.17
S	13.65	0.50	0.00	0.00	0.00	14.14
SSW	7.20	0.74	0.00	0.00	0.00	7.94
SW	2.98	0.25	0.00	0.00	0.00	3.23
WSW	2.23	0.99	0.00	0.00	0.00	3.23
W	4.47	0.50	0.50	0.00	0.00	5.46
WNW	1.99	2.23	0.25	0.00	0.00	4.47
NW	5.46	0.00	0.00	0.00	0.00	5.46
NNW	5.46	0.00	0.00	0.00	0.00	5.46
Total	82.88	13.65	1.24	0.00	0.00	97.77 % Winds
						2.23 % Calm
						100.00 % Total



d) Guenoc Valley

U.C. Cooperative Extension
Lake County
Cumulative Wind Speed Summary For Guenoc HQ
Beginning 1/01/2008 08:00 Ending 12/31/2013 20:00 (Banded)

	1 - 5	6 - 10	11 - 20	21 - 30	30 +	Total
N	3.47	0.99	0.00	0.00	0.00	4.46
NNE	2.48	0.50	0.00	0.00	0.00	2.97
NE	5.94	0.00	0.00	0.00	0.00	5.94
ENE	5.45	0.50	0.00	0.00	0.00	5.94
E	5.94	1.49	0.00	0.00	0.00	7.43
ESE	10.40	0.00	0.00	0.00	0.00	10.40
SE	6.44	0.50	0.00	0.00	0.00	6.93
SSE	0.50	0.50	0.00	0.00	0.00	0.99
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	5.45	0.00	0.00	0.00	0.00	5.45
SW	5.94	0.99	0.00	0.00	0.00	6.93
WSW	6.44	0.50	0.00	0.00	0.00	6.93
W	7.43	0.00	0.50	0.50	0.00	8.42
WNW	1.49	0.99	3.47	0.00	0.00	5.94
NW	4.95	0.50	0.00	0.00	0.00	5.45
NNW	4.95	0.00	0.00	0.00	0.00	4.95
Total	77.20	7.43	3.96	0.50	0.00	89.11 % Winds
						10.89 % Calm
						100.00 % Total

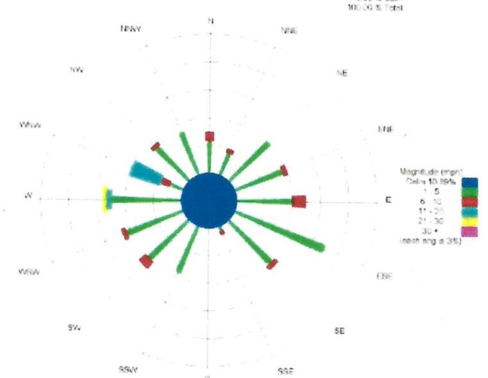


Figure 10 – Daytime (8am-8pm) wind frequencies and wind rose diagram by direction and speed for a) Kelseyville, b) Red Hills, c) Upper Lake, and d) Guenoc Valley stations during 2008-2013 managed by the Western Weather Group. See the Appendix for more information and Figure 1 for station locations.

Figure 22 Identified as Figure 10 above, daytime comparison of wind direction and wind speed.

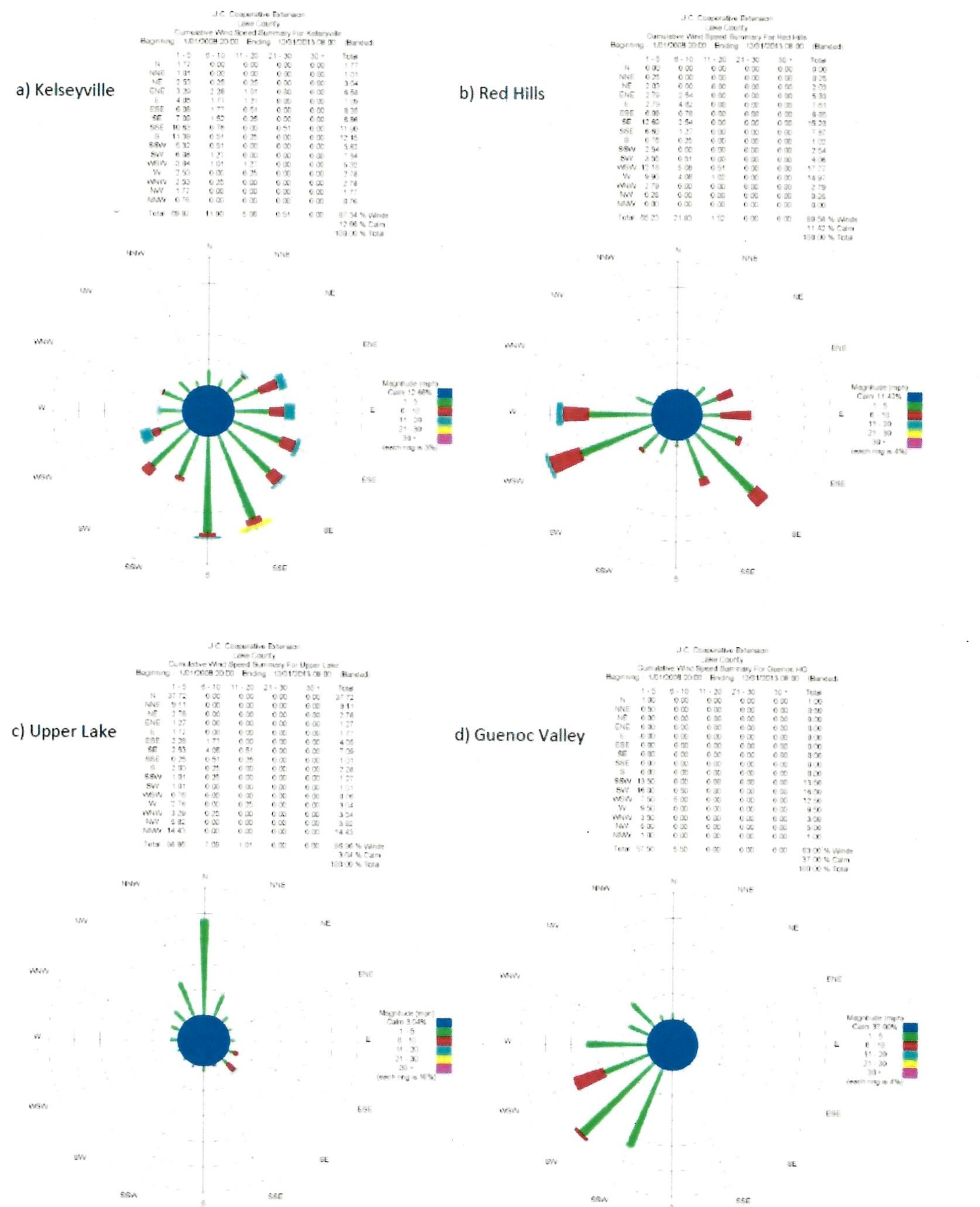


Figure 11 – Nighttime (8pm-8am) wind frequencies and wind rose diagram by direction and speed for a) Kelseyville, b) Red Hills, c) Upper Lake, and d) Guenoc Valley stations during 2008-2013 managed by the Western Weather Group. See the Appendix for more information and Figure 1 for station locations.

Figure 23 Identified as Figure 11 above, nighttime comparison of wind direction and wind speed.

Heat Summation - Heat summation provides further evidence that climate is a distinguishing feature of the proposed Upper Lake Valley area. Heat summation is calculated as the sum of the mean monthly temperature above 50° F during the growing season and expressed as degree days. The table below shows the degree day calculations for 2011 through 2016 for the Upper Lake Station which is located 0.4 miles north of State Highway 29 in Upper Lake. Based on this data, the proposed area is a low Region III location.

Growing Degree Day Totals (April 1 - October 31 - (Base 50°F)	
Western Weather Group for Lake County Winegrape Commission	
Upper Lake Station	
Year	**Degree Days (April 1 - October 31)**
2016	3147
2015	3326
2014	3343
2013	3169
2012	3026
2011	2809

Appendix Exhibit 28, page 90, contains a Portion of Table 3, Heat Summation as Degree-Days above 50° F for the Period of April 1 to October 31 of Various County Locations in California and a Few Foreign Locations, from General Viticulture by A. J. Winkler, James A. Cook, W. M. Kliewer, and Lloyd A. Lider. Upper Lake which is located in the proposed Elk Mountain area is listed in the table as a low Region III location.

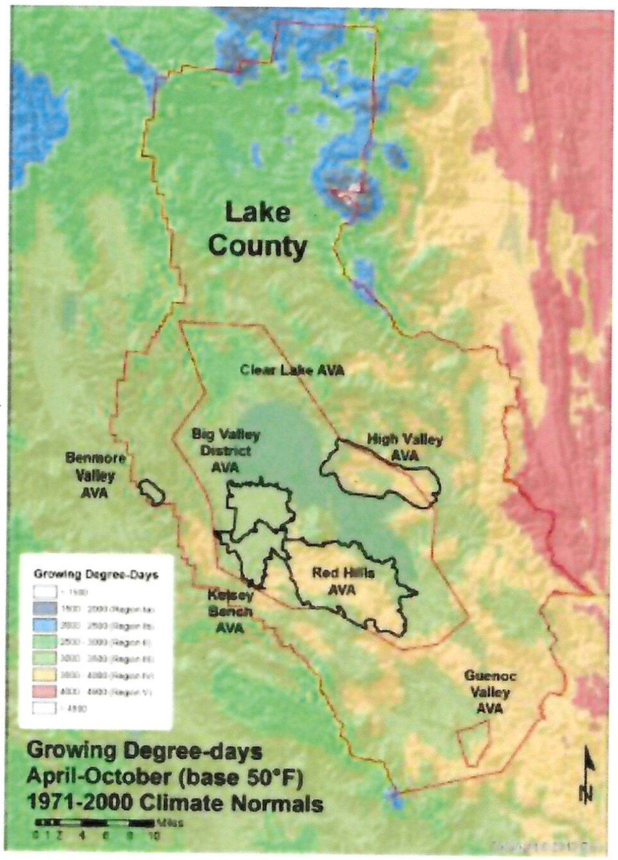
Importance to Viticulture

University of California Viticulture Professors Amerine and Winkler developed a system of Climate Regions to categorize locations based on degree days. Heat summation uses a baseline temperature of 50° F because there is almost no shoot growth below this temperature. Locations are categorized as Region I with less than 2500 degree days, Region II with 2501 to 3000 degree days, Region III with 3001 to 3500 degree days, Region IV with 3501 to 4000 degree days, and Region V with over 4001 degree days. Their approach is universally accepted as the most important climatic factor in predicting a site's suitability for growing specific grape varieties.[86]

[86] A J Winkler, James A Cook, W M Kliewer, Lloyd A Lider, General Viticulture University of California Press, 1962, p 61 - 71

Boundary Discussion

Gregory Jones, PhD, completed a study of the climate of Lake County for winegrape production in 2014. One of the areas that he examined was heat summation days for the seven American Viticultural Areas (AVA) of Lake County. Figure 24 below based on the work of Amerine and Winkler and updated by Jones shows the minimum, maximum, and median degree days for each AVA.[87]



AVA Name	Median	Max	Min
Big Valley District	3245	3281	3171
Benmore Valley	3248	3332	3155
Kelsey Bench	3250	3593	3189
Clear Lake	3267	3811	2799
Guenoc Valley	3481	3796	3420
High Valley	3548	3755	3139
Red Hills	3595	3753	3155

To compare the growing degree-day characteristics of Lake County AVAs to other California AVAs see Appendix Table 1.

Figure 14 – Lake County average growing degree-days (F° units, Apr-Oct, base 50°F and no upper limit; 1971-2000 Climate Normals) with the seven regional AVAs. Note that the class ranges mapped here corresponds to traditional Winkler Regions (Winkler et al. 1974) and updates to the lower Region I class and limits to the Region V class found by Jones et al. (2010) and Hall and Jones (2010). (Data Source: Daly et al. 2008). The table on the right represents the median, maximum, and minimum values for the seven AVAs, sorted by the lowest to highest median values.

Figure 24(Identified as Figure 14 above)

The proposed area is in the northern section of the Clear Lake AVA. Based on weather data from Western Weather Group for years 2011 through 2016, the table in Figure 25 shows the same data for the proposed area.

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[87] Gregory V Jones, PhD, Climate Characteristics for Winegrape Production in Lake County California, report for Lake County Winegrape Commission, www.lakecountywinegrape.org, 2014, page 23

Proposed Upper Lake Valley		
Min	Median	Max
2809	3158	3343

Figure 25 Minimum, maximum, and median degree day calculations based on weather data for years 2011 - 2016.

North – There are no AVAs that lie totally to the north of the proposed area. However, the degree days for Clear Lake AVA which contains the proposed area has a slightly lower minimum but higher maximum and median degree day calculations and falls between a Region II location at the lower end and a Region IV location at the higher. The proposed area falls between a Region II location at the lower end and a Region III location for the median and maximum growing degree-day calculations.

East – The High Valley AVA sits to the east of the proposed area. This area would be classified as a Region III based on the minimum calculation and a Region IV for the median and maximum growing degree-days. The proposed area is cooler with growing degree-days in line with a Region II location at the lower end and a Region III location for the median and maximum degree day calculations.

South – The Big Valley District – Lake County AVA lies to the south of the proposed area. This area falls in the Region III location across the minimum, median, and maximum degree-day calculations. The proposed area is cooler based on both the minimum and median growing degree-days and slightly warmer for the maximum total. The proposed area falls between a Region II location and Region III location.

West – The Benmore Valley AVA lies to the west of the proposed area. The data for this area shows that it is also a Region III location. The proposed area has a lower minimum growing degree-days and median degree-days, but a slightly higher maximum growing degree-days, classifying this area as a Region II to Region III location.

AVA within an AVA: Discussion of the Clear Lake AVA Petition Evidence

This petition seeks to establish the Elk Mountain AVA within the larger Clear Lake AVA. The Clear Lake AVA was established in final regulations published by the Bureau of Alcohol, Tobacco and Firearms in Volume 49, Number 90 of the Federal Register on May 8, 1984. The Clear Lake AVA included reference to Big Valley as well as other geographical regions within its boundaries. This was the second viticultural area in Lake County, with Guenoc Valley being the first one. At the time that this AVA was requested, the area that it represented included over 3000 acres planted to vines and 3 commercial wineries, two of which were located in Big Valley. The petition was submitted by 3 of the grape growers and winery owners.

Since the approval of the Clear Lake AVA, the wine industry in Lake County has grown substantially. Today, there are over 9455 acres planted to wine grapes, over 180 growers in the

County, and 35 wineries. AVAs have been approved for Big Valley District (BVD), Kelsey Bench (KB), Red Hills (RH), and Benmore Valley (BV) all of which lie within the boundaries of the Clear Lake AVA, and High Valley (HV), the majority of which is encompassed within the Clear Lake AVA.

Prior to the revision of the American Viticultural Area Regulations on January 20, 2011, many AVAs within AVAs were approved. The approval of the proposal to establish 7 new viticultural areas within the existing boundaries of the Lodi viticultural area is an example of an instance where this practice was used. Like the widely accepted and internationally understood practice of "nesting" wine appellations, this delineation of the proposed Upper Lake Valley AVA within the existing Clear Lake AVA would provide substantial information on wine produced from grapes grown in this area for the consumer.

The following discussion demonstrates the similarities and differences between the larger Clear Lake AVA and the proposed Upper Lake Valley. While the distinctions are easily defined, we believe that the Clear Lake AVA continues to be a significant growing area that encompasses many different microclimates suitable to viticulture. Many of these growing areas are not part of another established or proposed separate AVA and would be damaged by the elimination of the Clear Lake AVA. In addition, Clear Lake AVA is used by wineries including Steele Wines, Rosa d'Oro Vineyards, Wildhurst Vineyards, and Cache Creek Vineyards on its labels.

Similarities: The Clear Lake AVA petition cited elevation, climate and watershed as distinguishing features. The proposed Upper Lake Valley area is similar to the Clear Lake AVA in elevation, climate and is part of the Clear Lake watershed. The petition to establish the Clear Lake AVA also cited elevation, noting that vineyards in the proposed area were planted at elevations between 1300 and 1800 feet. The elevations of the vineyards of the proposed Upper Lake Valley fit within this elevation range with vineyards in the proposed area between 1,350 feet and 1,470 feet above sea level.

The Clear Lake AVA cited the Clear Lake watershed as a second distinguishing feature, noting that the area encompassed by the Clear Lake AVA lies within the Clear Lake watershed. The proposed viticultural area lies within this watershed now known as the Lake County Subwatershed, part of the Sacramento Valley Watersheds. A map showing the Clear Lake watershed in included in Appendix Exhibit 29, page 91. The petition for the Clear Lake AVA claimed that the area enjoyed a unique climate pattern due to the influence of the Clear Lake watershed. The proposed Upper Lake Valley area is similarly affected by several of these factors including little fog compared to the coastal area and warmer temperatures than neighboring viticulture areas in Mendocino, Napa, and Sonoma Counties.

Differences: The proposed Upper Lake Valley is distinctly different from the larger Clear Lake AVA in both growing season and rainfall. The Clear Lake AVA petition stated "According to the publication entitled "Climatography of the United States No. 81-4, Decennial Census of U.S.

Climate," the growing season in Clear Lake is 223 days which is shorter than the surrounding areas." This is considerably different than the growing season in the proposed Upper Lake Valley. The Soil Survey of Lake County California states that the average frost free period for the valley regions around Clear Lake range from 150 to 210 days.[88] The growing season in the proposed area has a range of 172 to 232 days with a median of 202 days based on analysis of Upper Lake Station data for the years of 2011 through 2016. The Climate section of this petition includes a discussion of the data defining frost free periods in the Upper Lake Valley area and compared the ULV data with data defining the frost free periods in AVAs to the west, south, and east of the proposed area.

The differences in growing season are also supported by the discussion of heat summation. Heat summation defined as growing degree where the baseline temperature is 50° F or higher is widely accepted today as a better indicator of climate and suitability for grape cultivation and further demonstrates the differences between growing areas. Growing degree totals in the proposed Upper Lake Valley area ranged from a low of 2,809 to a high of 3,343 with a median of 3,158 for the years of 2011 through 2016 based on temperature data collected at the Upper Lake Station. This is consistent with the findings of Amerine and Winkler where Upper Lake which is within the proposed area was listed as a Region III location with heat summation of 3,100.[89] However, in the climate study conducted by Gregory V Jones, PhD, for the Lake County Winegrape Commission, heat summation for the Clear Lake AVA was a low of 2,799, a high of 3,811, and a median reading of 3,267 demonstrating that the larger Clear Lake AVA is warmer than the proposed area.[90]

The Clear Lake petition also spoke to average rainfall in for the Clear Lake area of about 37 inches per year and compared this data with average rainfall for Sonoma and Mendocino counties. We looked at several documents and data sources to evaluate rainfall in the proposed area. Historical average rainfall for Upper Lake which sits within the proposed Upper Lake Valley is 34.09 inches over the period of January 1, 1893 and December 12, 2006.[91] Rainfall data from the Upper Lake Station for the years of 2012 through 2016 ranged from a low of 20.53 inches in the 2015 drought year to a high of 41.43 in 2016. Finally, Bulletin 118 for the Upper Lake Basin states that rainfall for the area runs from a low of 35 inches to a high of 43 inches

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[88] National Cooperative Soil Survey, United States Department of Agriculture, Soil Conservation Service, Soil Survey of Lake County, California, (May, 1989), page 4

[89] A J Winkler, James A Cook, W M Kliewer, Lloyd A Lider, General Viticulture University of California Press, 1962, page 65

[90] [90] Gregory V Jones, PhD, Climate Characteristics for Winegrape Production in Lake County California, report for Lake County Winegrape Commission, www.lakecountywinegrape.org, 2014, page 23

[91] Western Regional Climate Center, Period of Record Monthly Climate Summary for Lakeport, CA and Upper Lake, CA, www.wrcc@dri.edu

which would make the average 39 inches.[92] All of these sources point to the fact that rainfall in the proposed area is significantly different from the larger Clear Lake AVA area.

AVA within an AVA: Discussion of the North Coast AVA Petition Evidence

This petition seeks to establish the Upper Lake Valley AVA which lies within the larger Clear Lake AVA and the North Coast AVA. The North Coast AVA was established in final regulations published by the Bureau of Alcohol, Tobacco and Firearms in Volume 48, Number 104 of the Federal Register on September 21, 1983. The North Coast AVA included reference to the western portion of Lake County as well as portions of Mendocino, Sonoma, Napa, Solano, and Marin Counties within its boundaries.

The North Coast AVA was approved less than a year before the Clear Lake AVA. Since that time, the wine industry in Lake County has grown substantially. Today, there are over 9455 acres planted to wine grapes, over 180 growers in the County, and 35 wineries. AVAs have been approved for Big Valley District (BVD), Kelsey Bench (KB), Red Hills (RH), High Valley (HV), and Benmore Valley (BV) with all of the Red Hills area and most of the High Valley area encompassed within the North Coast Lake AVA.

Prior to the revision of the American Viticultural Area Regulations on January 20, 2011, many AVAs within AVAs were approved. The approval of the proposal to establish 7 new viticultural areas within the existing boundaries of the Lodi viticultural area is an example of an instance where this practice was used. Like the widely accepted and internationally understood practice of "nesting" wine appellations, this delineation of the proposed Upper Lake Valley AVA within the Clear Lake AVA and larger North Coast AVA would provide substantial information on wine produced from grapes grown in this area for the consumer.

The following discussion demonstrates the similarities and differences between the larger North Coast AVA and the proposed Upper Lake Valley. While the distinctions are easily defined, we recognize that the North Coast AVA continues to be a significant growing area that encompasses many different microclimates suitable to viticulture. These growing areas span six counties and cover more than 3,000,000 acres of land. Many of the growing areas included in this larger AVA are not part of another established or proposed separate AVA and enjoy a distinct benefit by being part of North Coast. The North Coast AVA is used by numerous wineries including Bonterra, The Hess Collection, Langtry Estate & Vineyard, B R Cohn, Carruth Cellars and many more to identify wine made with grapes from six county area.

Similarities: The North Coast AVA petition cited topography and climate as distinguishing features. The topography of the North Coast was characterized as "valleys between the coast

[92] California Groundwater Bulletin 118, Upper Lake Basin, Hydrologic Region Sacramento River, High Valley Groundwater Basin, last update 2/27/04

ranges running parallel to the Pacific Ocean shore and the lower slopes of these ranges"[93]. The proposed Upper Lake Valley area shares this topography with three named valleys, Bachelor Valley, Middle Creek Valley, and Clover Valley forming a central valley that runs to the shoreline of Clear Lake as well as the surrounding slopes. The flat valleys and tillable hillsides provide excellent growing areas for grapes.

The North Coast AVA petition also cited climate factors including growing degree days and rainfall. According to evidence reported for the North Coast, growing degree days ranged from Region II to Region III. Upper Lake was specifically named in the final ruling, with 2967 degree days. Degree day calculations for Upper Lake for years of 2011 reflect a similar pattern with a low of 2809 degree days, a high of 3343 degree days, and a median of 3158 degree days, all within the range of Region II to Region III. This is consistent with the findings of Amerine and Winkler where Upper Lake which is within the proposed area was listed as a Region III location with heat summation of 3,100.[94]

Differences: The North Coast petition and final ruling noted average rainfall of 36.2 inches for the region measured at 6 stations in Napa, Sonoma, and Mendocino. The rainfall for the proposed Upper Lake Valley recorded at the Upper Lake station for the years of 2012 – 2016 ranged from a low of 20.53 inches in the 2015 drought year to a high of 41.43 in 2016 with an average of 35.34 inches per year. This data is further supported by average rainfall of 34.09 inches recorded by Western Regional Climate Center for Upper Lake over the period of January 1, 1893 and December 12, 2006.[95] Finally, Bulletin 118 for the Upper Lake Basin states that rainfall for the area runs from a low of 35 inches to a high of 43 inches which would make the average 39 inches.[96] All of these sources point to the fact that rainfall in the proposed area is significantly different from the larger North Coast area.

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[93] Federal Register, 27 CFR Part 9, North Coast Viticultural Area, September 21, 1983, page 5

[94] A J Winkler, James A Cook, W M Kliewer, Lloyd A Lider, General Viticulture University of California Press, 1962, page 65

[95] Western Regional Climate Center, Period of Record Monthly Climate Summary for Lakeport, CA and Upper Lake, CA, www.wrcc@dri.edu

[96] California Groundwater Bulletin 118, Upper Lake Basin, Hydrologic Region Sacramento River, High Valley Groundwater Basin, last update 2/27/04

Upper Lake Valley Boundary Description

The proposed Upper Lake Valley Viticulture Area is located in Lake County, California and is within the North Coast Viticulture Area and the Clear Lake Viticulture Area. The area is bounded by State Highway 20 on the southwest, the 1,600 foot elevation line on the west, the Mendocino National Forest on the northwest, the 1,600 foot elevation line on the north until it meets the Mendocino National Forest on the northeast, the 1,600 foot elevation line along the east, and the shores of Clearlake on the south.

Boundaries plotted in a clockwise direction are found on four USGS 7.5 minute series, scale 1:24 000 topographic maps:
Lakeport Quadrangle (1958; photo-revised 1978; minor revision 1994)
Upper Lake Quadrangle (1996)
Bartlett Mountain Quadrangle (1996)
Lucerne Quadrangle (1996). Maps are contained in Appendix Exhibit 30, pages 92 – 95.

The beginning point is at the western shore of Clear Lake approximately 3,650 feet southwest of point where the northern boundary line of Section 32, T15N, R9W, Lakeport Quadrangle intersects the shoreline of Clear Lake; then

Proceed westerly in a straight line approximately 1100 feet to the intersection of the unnamed road locally known as Lafferty Road, Section 31, R15N, R9W; then

Follow the unnamed road locally known as Lafferty Road in a westerly, then northwesterly direction to its intersection with the secondary highway locally known as Lakeshore Boulevard; then

Proceed north on the secondary highway locally known as Lakeshore Boulevard to the intersection with an unnamed road known locally as Whalen Way; then

Proceed west on Whalen Way to the intersection with State Highway 29 in the northwest corner of Section 31, T15N, R9W; then

Follow State Highway 29 north, then northwest to its intersection with the northern boundary of Section 24, T15N, R10W, Upper Lake Quadrangle; then

Proceed west along the northern boundary line of Section 24, then along the northern boundary line of Section 23 to the intersection of the northern boundary line of Section 23 with the 1,600 foot elevation line; then

Follow the meandering 1,600 foot elevation line northerly, then westerly, then southerly, then northerly, then easterly, then generally northwesterly as it crosses Sections 14, 15, 10, 9, 16, back into Section 9, then into Section 17 to a point approximately 250 feet northwest of the unnamed road marked 4WD in the northeast quadrant of Section 17; T15N, R10W; then

Follow a straight line approximately 1550 feet in a north-northeast direction to the intersection of the 1,600 foot elevation line in Section 8, T15N, R10W; then

Pick up the 1,600 foot elevation line as it meanders in a generally northwesterly direction crossing Sections 8, 9, 4, 5,33, and 32 into Section 29; then

Continue to follow the 1,600 foot elevation line first northeasterly, then easterly, then southeasterly to the point of intersection with the southwestern border of the Mendocino National Forest, common boundary line between Sections 27 and 28, T16N, R10W; then

Follow the border of the Mendocino National Forest south approximately 75 feet, along the western side of Section 27 to the southwest corner of section 27, then east approximately 40 feet along the southern side of Section 27 to the intersection of the 1,600 foot elevation line; then

Follow the 1,600 foot elevation line in a generally southeasterly direction crossing Sections 34, 3, 2, and Section 1; then generally northeasterly crossing Section 1 and Section 36 to the point of intersection of the 1,600 foot elevation line and the southern boundary line of the Mendocino National Forest, northern boundary Section 36, T16N, R10W; then

Continue along the 1,600 foot elevation line across the Mendocino National Forest boundary line and proceeding first westerly, then generally northerly to its intersection with Kirkpatrick Creek in the northern half of Section 21; then

Follow Kirkpatrick Creek northeasterly to its intersection with County Road 301 in the northeast ¼ of Section 26; then

Follow a straight line easterly approximately 1,200 feet across Middle Creek to the intersection of the unnamed dirt road known locally as White Rock Canyon Road and the unnamed seasonal creek which follows White Rock Canyon on the east side of Middle Creek, in the northeast quarter of Section 26; then

Follow the unnamed seasonal creek in a northeasterly direction along White Rock Canyon approximately 2,440 feet to its intersection with the 1,600 foot elevation line in the northwest ¼ quarter of Section 25; then

Proceed along the meandering 1,600 foot elevation line southeasterly, then northeasterly crossing into Section 30; then south-southeasterly to its intersection with the Mendocino National Forest boundary line between Sections 30 and 31, R9W, T16N; then

Follow the 1,600 foot elevation line in a generally south - southeasterly direction to its intersection with the boundary of the Mendocino National Forest southeast ¼, eastern boundary line, Section 31; then

Proceed south, then east along the Mendocino National Forest boundary to its intersection with the 1,600 foot elevation line, western ½, northern boundary, Section 5; then

Pick up the 1,600 foot elevation line; continuing in a generally southeasterly direction crossing Sections 5, 4, and 9 along the northeastern side of Clover Valley to the point of intersection with the boundary of the Mendocino National Forest, southeast ¼, eastern boundary, Section 9, T15 N; R 9W Bartlett Mountain Quadrangle; then

Follow the boundary of the Mendocino National Forest southerly, then easterly to the point of intersection with the 1,600 foot elevation line, northwest ¼, northern boundary, Section 15; then

Follow the 1,600 foot elevation line southerly then northwesterly direction crossing Sections 15, 16, 9, and 8; then generally south-southeasterly crossing Sections 8, 17, 16, 21, 22, 27, 26, and 25 to the intersection with the common boundary between Sections 25 and 36 T15N, R9W, Lucerne Quadrangle; then

Continue to follow the 1,600 foot elevation line southerly to its intersection with the western side of the northeast ¼ of the southeast ¼ of Section 36 T15N R9W; then

Follow south along the western side of the northeast ¼ of the southeast ¼, and the southeast ¼ of the southeast ¼ of Section 36 approximately 1,380 feet to the shores of Clear Lake, Section 36, T15N, R9W; then

Follow the shoreline of Clear Lake in a northwesterly, then westerly, then southwesterly, then northwesterly, across the Rodman Slough, then southwesterly to the point of beginning, Section 31, T15 N, R 9W, Lakeport Quadrangle.