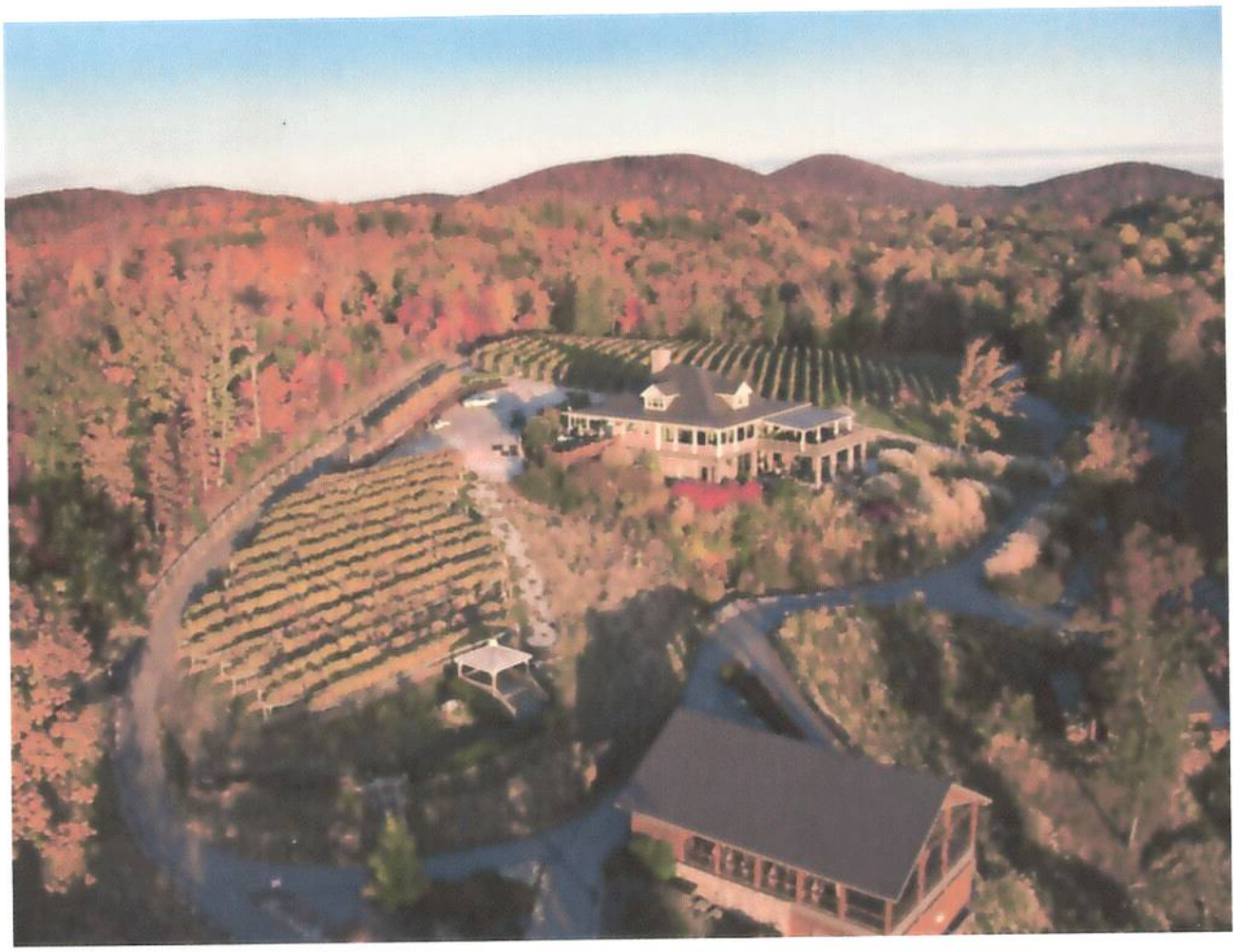
Petition for Establishment of an American Viticultural Area

To be Designated

Dahlonega Plateau



Submitted on Behalf of the Vineyard and Winery Operators of the Dahlonega Region of Northern Georgia

April 2015

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1) Overview

The Dahlonega Plateau, sometimes referred to as the Dahlonega Uplands, is a narrow, northeast-southwest trending physiographic province located in the northern foothills of the Georgia Piedmont (Figure 1). Known for its past history as an important gold mining region of the 19th and early 20th century, the area is now gaining wide recognition for its grape vineyards and wine production. This petition seeks to have the northeastern portion of the Dahlonega Plateau designated as an American Viticultural Area under the rules and regulations of the US Department of the Treasury's Alcohol Tax and Trade Bureau. In this petition we demonstrate the significance of the name Dahlonega Plateau and how it relates to the area of the proposed AVA, describe the viticultural activities of the proposed area, define the boundaries of the proposed AVA, describe the environmental and physical characteristics that distinguish it from surrounding areas, and explain how these differences are important factors to the area's viticultural activities.

The Dahlonega Plateau is located in parts of Lumpkin, Dawson, White, Pickens, and Cherokee Counties, Georgia (Figures 1 and 2). Viticultural activities are confined to Lumpkin and White Counties in the northeastern portion of the Plateau. With its higher elevation the northeastern portion has important viticultural characteristics, such as temperature, precipitation, length of growing season and solar insolation, that distinguish it from the lower-elevation, southwestern part of the Plateau. We are petitioning, therefore, to apply the "Dahlonega Plateau AVA" designation to the northeastern part of the Plateau only. In the Boundary Description section we present a detailed description of our proposed AVA.

The area encompassing the entire Dahlonega Plateau is approximately 344 square miles, while the area of the proposed Dahlonega Plateau AVA is approximately 133 square miles, of which 27 square miles are part of the Chattahoochee National Forest. There is only one incorporated town in the proposed AVA, the town of Dahlonega, the county seat of Lumpkin County. Proximity of the Dahlonega Plateau to surrounding metropolitan areas[1] has made Dahlonega a popular tourist destination, and it is the principal jumping-off point for visitors who wish to explore the growing wine agritourism of the region.

At the present time there are seven wineries with eight vineyard operations in the proposed AVA. The total planted acreage of grapes is 110.35, with 29 varieties under cultivation, including *Vitis vinifera* (25 varieties), French-American hybrids (3 varieties), and one American variety. The dominance of vinifera grapes, considered the most commercially desirable wine grapes to grow in the United States, attest to the clear designation of the proposed AVA as a "*vinifera* province."

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[1] Atlanta is 66 miles south of the town of Dahlonega, Greenville, SC 127 miles northeast, Chattanooga, TN 108 miles northwest, and Birmingham, AL 209 miles southwest.

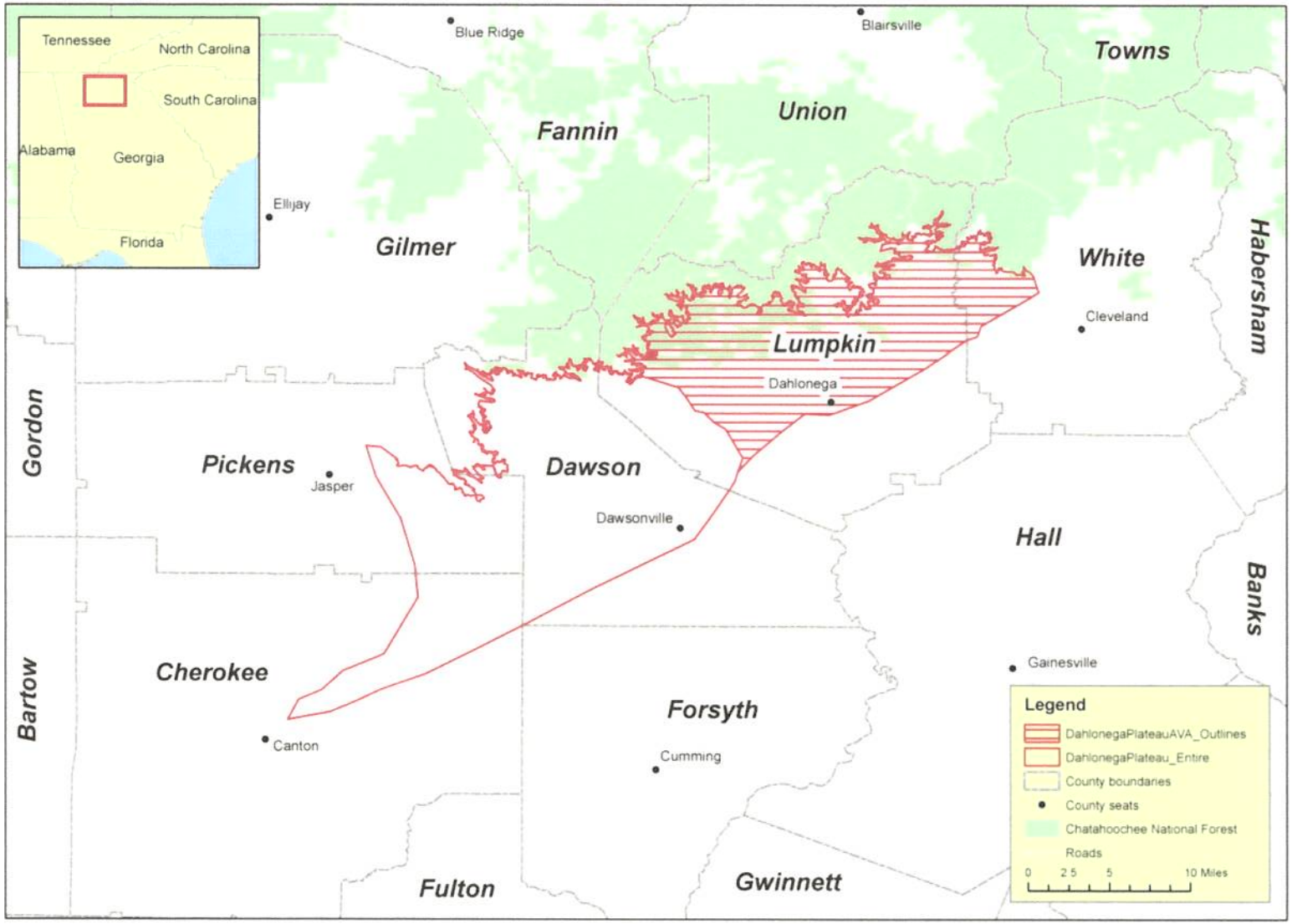

Figure 1. Location of the Dahlonega Plateau and the proposed Dahlonega Plateau AVA.

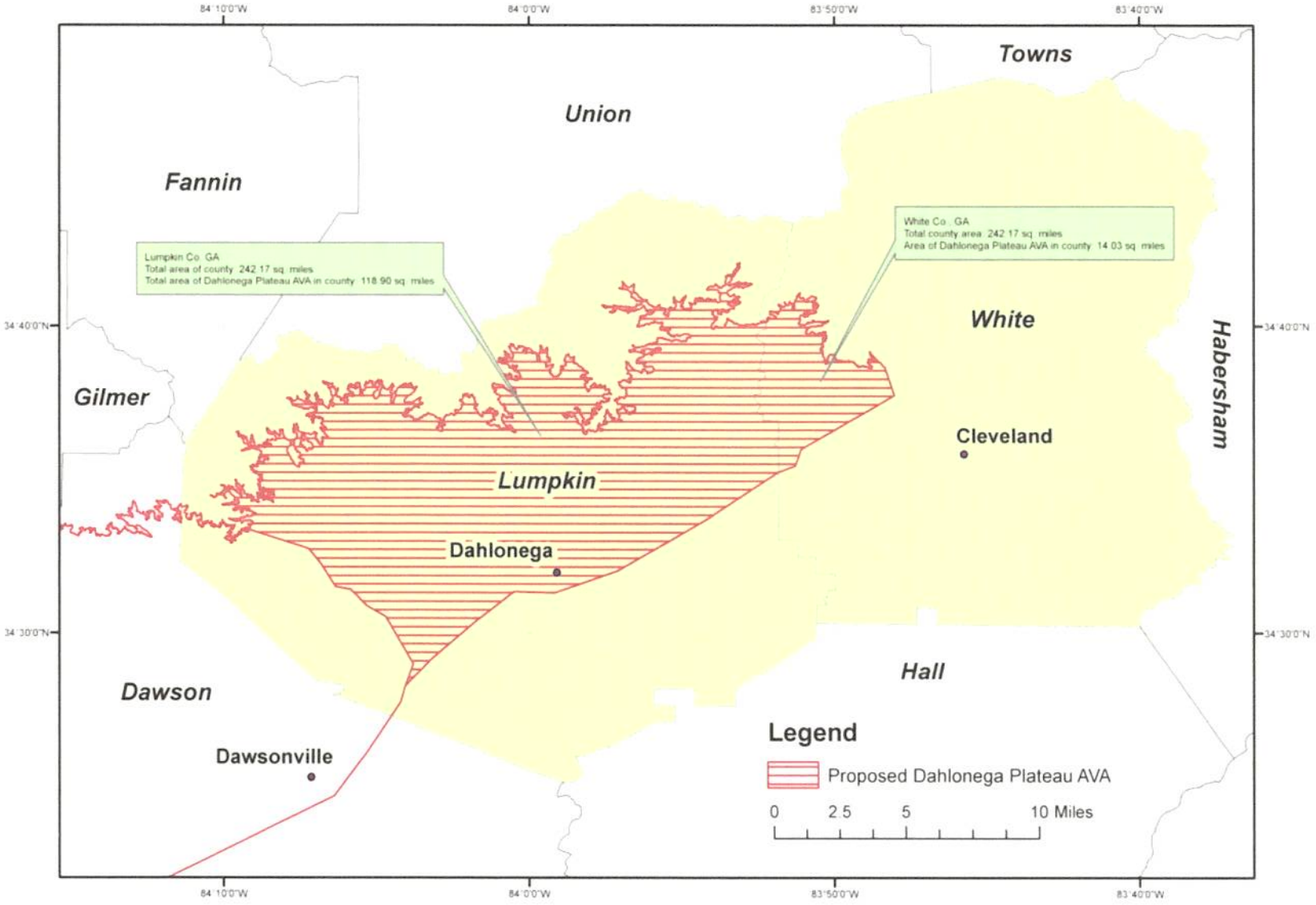

Figure 2: Location of the proposed Dahlonega Plateau AVA in Lumpkin and White Counties, GA.

The most important distinguishing characteristics of the proposed Dahlonega Plateau AVA revolve around its elevation and geomorphology, both of which play a major role in controlling the area's temperatures, precipitation, and growing season. All of these environmental factors combine to make the proposed AVA a unique grape-growing region with characteristics that differ markedly from the southwest portion of the Dahlonega Plateau and surrounding areas to the north, south and east.

2) Name Evidence

Widespread usage of the name Dahlonega derives from proximity to or association with the north Georgia town of the same name. Prior to settlement by Europeans this area of the state was home to the Cherokee people, and, in fact, the name Dahlonega originates from the Cherokee word *Dalonige,* which means 'yellow' or 'golden.' In 1829 gold was discovered in the area precipitating a gold rush and leading to establishment of the boom town of Dahlonega. Originally named Talonega by the Georgia General Assembly in 1833, the name was changed to Dahlonega by the Assembly in 1837. The Dahlonega Mint was established by the US government in the town in 1838 and operated there until the outbreak of the American Civil War. The gold rush in northern Georgia subsided after richer deposits were discovered in California in 1849, but mining continued in the region until 1935 when it essentially ceased (German, 2013).

Today the name 'Dahlonega' is well established and used extensively throughout Lumpkin and surrounding counties for a number of organizations, businesses, events and natural features. The historic courthouse of Lumpkin County, located in Dahlonega Square, is a part of the town's National Registered Downtown Historic District and is home to the Dahlonega Gold Museum.[2] Geologists have long recognized the unique geological history and significance of the region around Dahlonega, which is known in the geological literature as the Dahlonega Gold Belt (German 2013).

The Dahlonega-Lumpkin County Chamber of Commerce & Visitors Bureau[3] serves more than 525 businesses of all sizes, industries and professions and provides "... leadership in creating a healthy climate for economic development and job creation, and also serves as a resource where members can gain business knowledge, insight and strength as business professionals." The Dahlonega Downtown Development Authority[4] is an organization whose mission "...is to stimulate and sustain economic development in Downtown Dahlonega by encouraging cooperation and building leadership; by advancing a positive image of downtown and promoting it as an exciting place to live, shop, and invest; by sustaining and improving the appearance of downtown; and by strengthening and expanding the economic base of downtown." The Dahlonega Jaycees[5] is a non-profit organization of volunteers that "...benefit the community by providing scholarships, assistance to families in need, volunteers for community events, and by promoting a positive community spirit." The Dahlonega Arts

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2 http://gastateparks.org/DahlonegaGoldMuseum
3 https://www.facebook.com/DahlonegaLumpkinChamber/info?ref=page_internal
4 http://dahlonegadda.org/
5 http://www.dahlonegajaycees.com/home

Council[6] fosters and promotes the arts in the Dahlonega region through festivals and exhibits. The Dahlonega Nugget,[7] the local newspaper, advertises that it provides "The Gold of the News."

The Dahlonega First Friday Night Concert Series hosts a six-month long series of musical events running from May into October. The Dahlonega Trail Fest[8] is an annual celebration of the vernal equinox marking the first day of spring. The Dahlonega Literary Festival[9] is an annual celebration of books and reading in which invited authors of various genres share their ideas and experiences in a series of presentations and sit-down luncheons. The Dahlonega Wine Trail advertises a unique experience for wine lovers in "the heart of Georgia wine country," where participants can "enjoy spectacular views, award-winning wines, and the opportunity to meet our winemakers." In addition to historical and natural sites, civic and government organizations, and local festivals and events, numerous businesses, including shops, restaurants, lodging facilities, medical practices, places of worship, and industries proudly incorporate the name 'Dahlonega' in their titles.

The term Dahlonega Plateau is also well established in historical and present day usage, especially in the scientific literature. The first written reference to this physiographic feature is that of Glenn (1911) who describes the area around the town of Dahlonega as follows: "In the Chestatee basin about Dahlonega the upland is an old, well-dissected plateau, whose topographic form is very similar to that of the Asheville Plateau of western North Carolina, and its age and origin are doubtless also the same." In a classic book on the physical geography of Georgia, Laforge (1925) describes the Dahlonega Plateau as the northernmost and highest physiographic subdivision of the Georgia Piedmont, with a number of topographic subdivisions lying between the Blue Ridge mountains to the north and the Atlanta Plateau to the south. Fenneman (1938) in his description of the physiography of the eastern United States uses the term Dahlonega Plateau and defines it as located at the "high inner edge of the Piedmont in Georgia." More recently Faye et al (1980) of the US geological Survey described the fluvial morphology of the Chattahoochee River on the Dahlonega Plateau.

References to the Dahlonega Plateau are common in travel guides describing the Piedmont region of north Georgia. Here is a description offered online by Offbeat Travel,[10] a website dedicated to unusual and interesting travel destinations around the world: "The mountains of Georgia once prized for their gold, are now cultivated for their grapes. They call it the Dahlonega Plateau. A broad high plain shadowed by some of Georgia's highest mountains, the Dahlonega Plateau offers near perfect growing conditions. It offers good drainage (crucial since grapes don't enjoy having wet roots) and shelter from extreme weather moving in from the north while it is open to the south and east for good sun. The altitude in the mountains means that the temperatures cool down in the evenings, while the humidity of the southeast portion of the country is good for the grapes."

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6 http://www.dahlonegaarts.org/
7 http://www.thedahloneganugget.com/
8 http://www.dahlonegatrailfest.org/
9 http://dahlonegaliteraryfestival.wordpress.com/
10 http://www.offbeattravel.com/dahlonega-georgia.html

And in the 2010 book "Georgia Travel Adventures," the Dahlonega Plateau is described as follows: "In the northeast section of the Piedmont lies the Dahlonega Plateau, a deeply eroded region of steep, forested hills and narrow valleys where the peaks rise some 1,800 feet above sea level near the Blue Ridge Mountains."

The term Dahlonega Plateau has also been used by vineyard operators in descriptions of their wines and vineyards to evoke the unique terroir of the region. The following is from a label on a bottle of wine from Wolf Mountain Vineyards: "The Boegner Family is proud to release our limited bottling of Instinct. This wine represents our "field blend" of Mourvedre, Syrah, Cabernet Sauvignon and Touriga from our Family Estate, creating a Rhone-Style Blend, rich in dark berry flavors with unique complexity and elegant tannins. Instinct is produced from Georgia Mountain Grown grapes, handpicked at the 1800 foot elevation of the Dahlonega Plateau." The website of Frogtown Cellars describes the location of its principal vineyard as follow: "This estate property is within the geographically defined "Dahlonega Plateau." Frogtown believes the Dahlonega Plateau will soon become a recognized American Viticulture Area (AVA)..."

Clearly the terms "Dahlonega" and "Dahlonega Plateau" are well grounded in the historical and present day life and lore of the region around Dahlonega, GA . The vineyard operators of the region believe, therefore, that the designation "Dahlonega Plateau AVA" is a fitting and appropriate appellation to describe their unique viticultural region.

3) Boundary Descriptions

Although geographers and geologists have used the term "Dahlonega Plateau" repeatedly in the historical literature, none has provided a definitive topographic definition of the feature. Even the more modern literature is vague as to specific boundaries. In 1976 William Clark and Arnold Zisa published the "Physiographic Map of Georgia" [11] (Figure 3) and outlined an area called the Dahlonega Uplands District, an alternative name often applied to the Dahlonega Plateau. They describe the area as follows: "The rough and hilly northeastern part of the Dahlonega Upland District stands 1500-1700 feet above sea level. Streams in this area flow south out of the Blue Ridge Mountains District, and have cut deep, narrow valleys 500-600 feet below the surrounding surface. In the southern and southwestern portions, surface elevations decrease to 1200 feet. Stream valleys are wider, more open, and only 200-300 feet below the adjacent surface. The southern and western boundaries are formed by the low linear, parallel ridges of the Hightower-Jasper Ridges District." Clark's and Zisa's description of the Hightower-Jasper Ridges district is as follows: "Although the Hightower and Jasper Ridges have different structural and lithologic histories, they are topographically so similar that they may be discussed together. The Hightower-Jasper Ridges District consists of a series of low, linear, parallel ridges separated by narrow valleys. The Hightower Ridges range in elevation form 1,500 feet in the northeast to 1,000 feet in the southwest. Relief in this area varies from 500 feet in the northeast to 200 feet in the southwest. The Jasper Ridges bisect the McCaysville Basin District and continue

[11] http://www.sherpaguides.com/georgia/fire_forest/sidebars/physiographic_districts.html

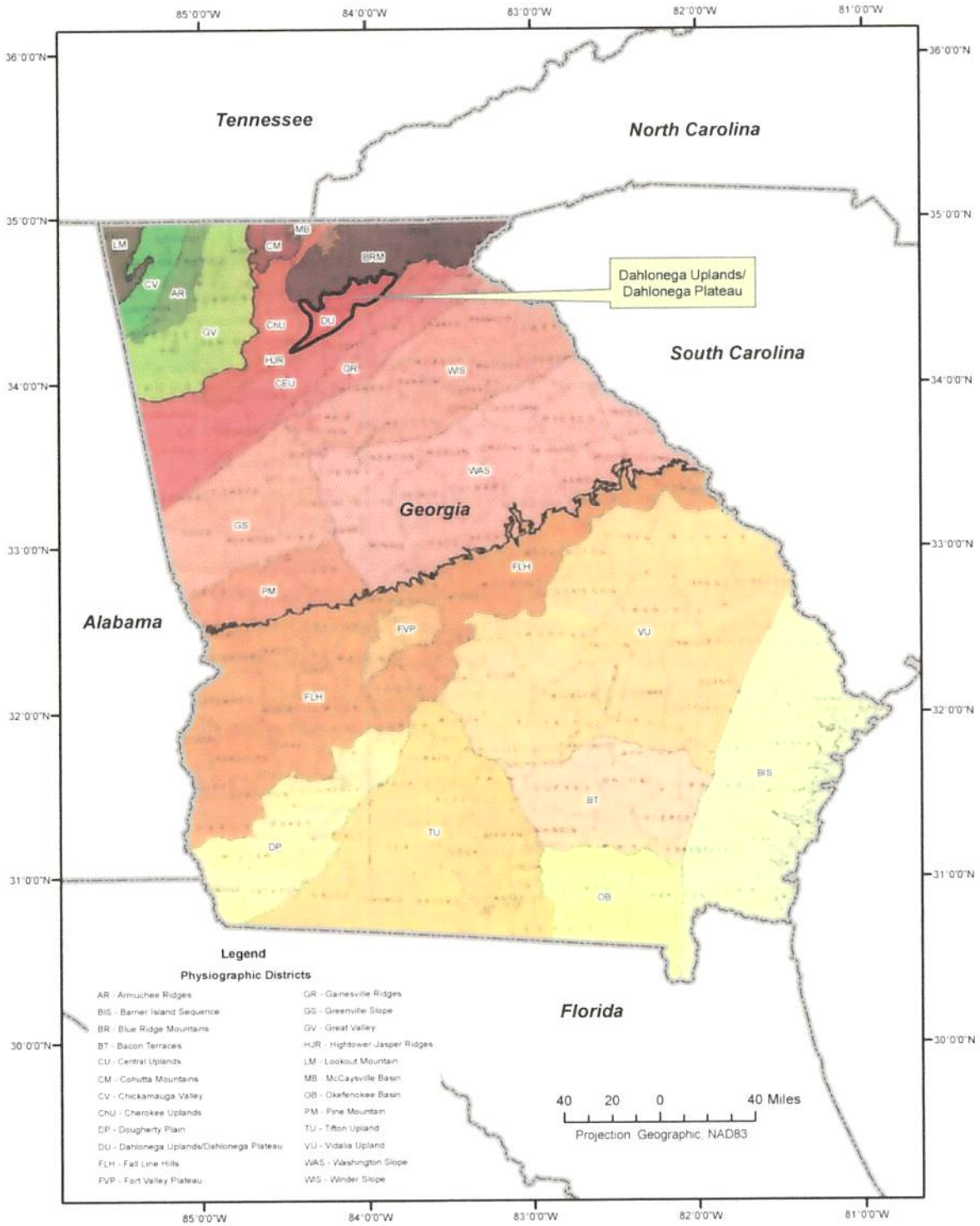

Figure 3: Physiographic map of Georgia showing location of the Dahlonega plateau (after Clark and Zisa, 1976).

southward as a low area between the Cohutta and Blue Ridge Mountains. These ridges range in elevation from 2,400 feet in the north to 1,200 feet near Canton, where they join the Hightower Ridges. Relief varies from 800 feet in the north to 200 feet near Lake Allatoona. Some structural control of streams in the district is exhibited by the modified rectangular drainage patterns. The southern and western boundaries are located where there is a decrease in the density of the linear ridges."

The Clark and Zisa map (Figure 3), which accompanies the above descriptions, is regional in nature and the small scale of the map precludes it from showing exact, detailed boundaries of physiographic features. Nevertheless it forms the basis for a more rigorous definition of the Dahlonega Plateau, as their written description gives the following clues as to the limits of the feature:

- The Dahlonega Plateau lies between the high peaks of the Blue Ridge Mountains on the north and the Jasper-Hightower Ridges on the west and southeast.
- The Jasper Ridges have a sinuous trend but are oriented generally north-south and lie along the west margin of the Dahlonega Plateau.
- The Hightower Ridges are oriented northeast-southwest and border the Dahlonega Plateau along its south and southeast sides.
- The Jasper and Hightower Ridges converge northeast of the town of Canton, GA, and the termination of the Dahlonega Plateau occurs in the "Y" formed by this convergence.
- On the northeastern end, the Dahlonega Plateau terminates at the convergence of the Blue Ridge Mountains with the Hightower Ridges.
- The Hightower-Jasper Ridges display a rectangular drainage pattern that distinguishes them from the Dahlonega Plateau terrain.

Using modern Digital Elevation Models (DEMs) the trends and limits of the elongated and narrow ridges and valleys that bound the Dahlonega Plateau on its west (Jasper Ridges) and southeast sides (Hightower Ridges) can be readily seen. We have drawn our map such that it strictly limits the Dahlonega Plateau to that area of trendless topography[12] that lies east of the Jasper Ridges and north and northwest of the Hightower Ridges. The rectangular drainage pattern recognized by Clark and Zisa has also been noted by Forrest (2013), who identified it as a typical 'trellis' pattern that differs distinctly from the 'dendritic' pattern of the Dahlonega Plateau. These differences in drainage patterns form a principal characteristic on which to delineate the boundary between the Plateau and the Hightower-Jasper Ridges.

On the northwest and north sides of the Dahlonega Plateau the Clark and Zisa map shows only a generalized boundary with no topographic control. We have chosen to draw the boundary with the Blue Ridge Mountains along the 1800-foot topographic contour, this elevation representing a general

[12] By 'trendless topography' we mean that the Dahlonega Plateau terrain is not characterized by elongate ridges and valleys as is the terrain of the Hightower and Jasper Ridges districts; rather it is characterized by rounded hills and mountain tops that have no regional orientation.

break in slope between steeper peaks to the north and the gentler slopes of the Dahlonega Plateau to the south.

The southwest end of the Dahlonega Plateau ends where the Jasper and Hightower Ridges converge, and likewise the northeast end is drawn where the Blue Ridge and Hightower Ridges converge. Using the above criteria and the TTB requirement that the boundaries must be placed between points and markings clearly visible on USGS topographic maps, our delineation of the Dahlonega Plateau is shown in Figure 1. Boundaries of the proposed Dahlonega Plateau AVA are shown on Figure 4. The boundaries are delineated in detail on nine 7.5' USGS topographic quadrangle maps at a scale of 1:24,000 (Figure 4 and Table 1) that are included with this petition.

a) Boundary Description of the Proposed Dahlonega Plateau AVA (Figure 4)

1) The beginning point of the boundary description of the proposed Dahlonega Plateau AVA is an elevation point marked 1412 (Point 1) located in the north-central part of the Dawsonville Quadrangle.
2) Proceed northwest from Point 1 in a straight line to the elevation point marked 1453 in the Dawsonville Quadrangle (Point 2).
3) Proceed northwest in a straight line to the intersection of Arrendale Rd. and Windy Oaks Rd. (Point 3) in the Campbell Mountain Quadrangle.
4) Proceed northwest in a straight line to the intersection of the 1400-foot topographic contour with the Dennson Branch (Point 4).
5) Proceed northwest in a straight line to the intersection of the 1360-foot topographic contour with Mill Creek (Point 5).
6) Proceed northwest in a straight line to the intersection of the 1500-foot contour with Sheep Wallow Rd. (Point 6).
7) Proceed northwest in a straight line to the intersection of Road 52 with the Chattahoochee National Forest boundary along the west side of the Campbell Mountain Quadrangle (Point 7).
8) Proceed northwest in a straight line to the center of the highest closing contour on a hilltop with elevation marked 2022 feet in the Nimblewill Quadrangle. The point at which this line crosses the 1800-foot topographic contour is Point 8.
9) At Point 8 turn east and follow the 1800-foot topographic contour through the Nimblewill, Campbell Mountain, Noontootla, Suches, Neels Gap, and Dahlonega Quadrangles into the Cowrock Quadrangle. The point at which the 1800-foot contour crosses the Tom White Branch in the Cowrock Quadrangle is Point 9.
10) Proceed southeast along the Tom White Branch to its intersection with the 1600-foot topographic contour in the Cowrock Quadrangle (Point 10).
11) Proceed southeast in a straight line to the intersection of Cathey Creek with the road marked Alt. 75 in the Cowrock Quadrangle (Point 11).
12) Proceed southwest in a straight line to the intersection of the 1500-foot topographic contour with Glade Branch (Point 12) in the Cleveland Quadrangle.

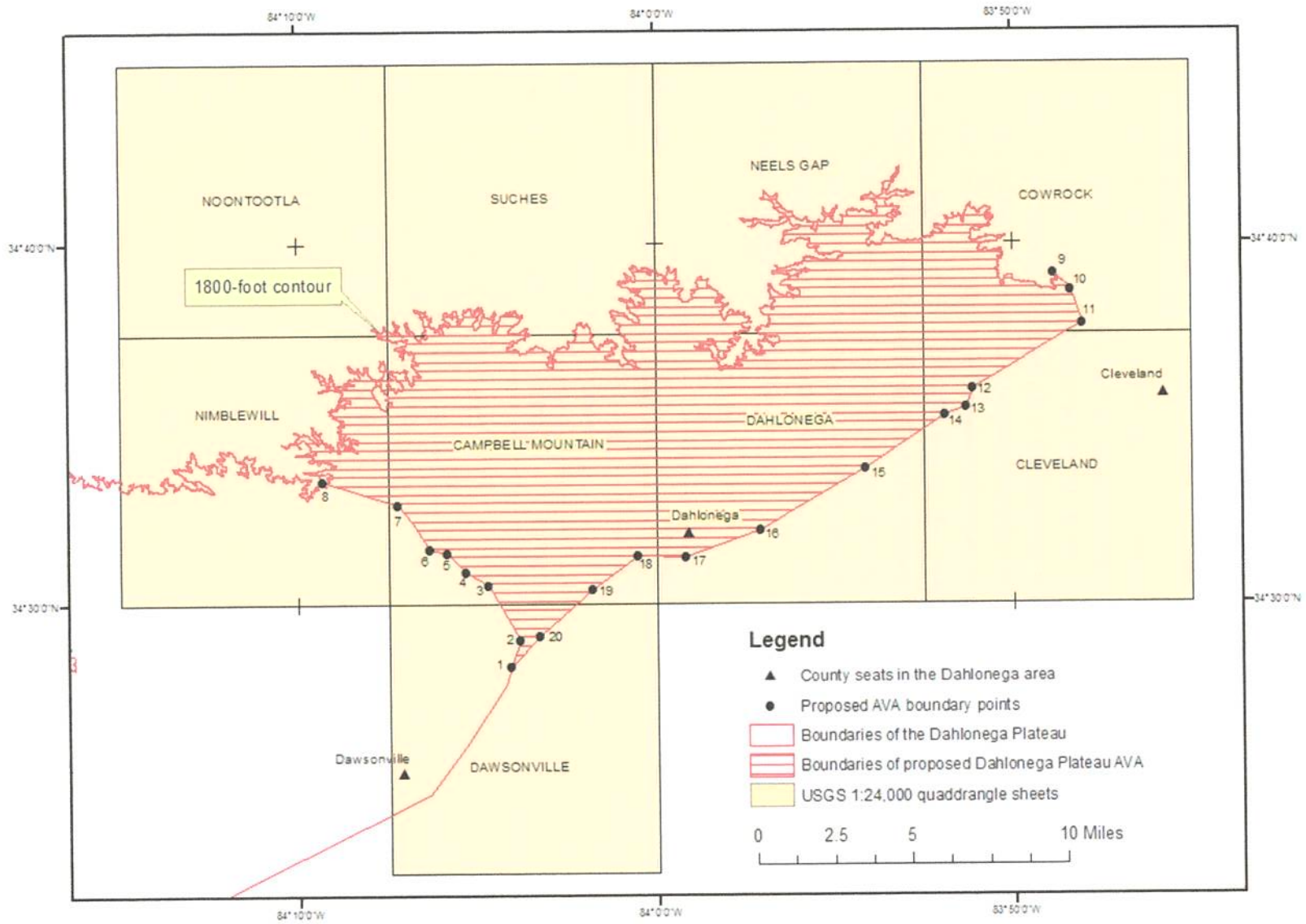

Figure 4: Boundaries of the proposed Dahlonega Plateau AVA and USGS 1:24,000 quadrangle sheets iin which it is located.

13) Proceed southwest in a straight line to the center of the highest closing contour atop an unnamed hill with elevation marked 1774 feet (Point 13) in the Cleveland Quadrangle.
14) Proceed southwest in a straight line to a benchmark marked 1623 feet (Point 14) in the Cleveland Quadrangle.
15) Proceed southwest in a straight line to benchmark marked 1562 feet (Point 15) in the Dahlonega Quadrangle.
16) Proceed southwest in a straight line to an elevation point marked 1480 feet (Point 16) at the Mt. Sinai Church in the Dahlonega Quadrangle.
17) Proceed southwest in a straight line to the center of the highest closing topographic contour atop Crown Mountain (Point 17) in the Dahlonega Quadrangle.
18) Proceed west in a straight line to the intersection of the 1160-foot topographic contour with Cane Creek (Point 18) in the Campbell Mountain Quadrangle.
19) Proceed southwest in a straight line to the intersection of the 1300-foot topographic contour with Camp Creek (Point 19) in the Campbell Mountain Quadrangle.
20) Proceed southwest in a straight line to the intersection of the 1200-foot topographic contour with the Etowah River (Point 20) in the Dawsonville Quadrangle.
21) Proceed southwest in a straight line to Point 1, completing the boundary of the proposed AVA in the Dawsonville Quadrangle.

Quadrangle Sheet Name	Map Scale	Map Date	Revision Dates	Mapped By	Published By
Campbell Mountain, GA	1:24,000	2014		USGS	USGS
Cleveland, GA	1:24,000	1951	1973, 1981	USGS	USGS
Cowrock, GA	1:24,000	1988		USGS and State of Georgia	USGS
Dahlonega, GA	1:24,000	1951		USGS	USGS
Dawsonville, GA	1:24,000	1997		USGS	USGS
Neels Gap, GA	1:24,000	1988		USGS and State of Georgia	USGS
Nimblewill, GA	1:24,000	1997		USGS	USGS
Noontootla, GA	1:24,000	1988		USGS and State of Georgia	USGS
Suches, GA	1:24,000	1988		USGS and State of Georgia	USGS

Table 1. USGS 1:24,000-scale, 7.5' topographic quadrangle sheets containing the boundaries of the proposed Dahlonega Plateau AVA.

4) Viticulture

Presently there are seven wineries with eight vineyards[13] operating on the Dahlonega Plateau, all located within the area of the proposed Dahlonega Plateau AVA (Table 2 and Figure 5). Twenty-nine varieties of grapes are under cultivation in a total of 110.35 acres (Table 3). An additional 11.35 acres have been trellised but not yet planted, and 0.58 acres are planned by one vineyard for future development. The oldest active vineyard is Three Sisters, which was planted in 1998 and had its first commercial harvest in 2000. Frogtown Cellars is the largest vineyard with 43.50 acres under cultivation and over 10,000 cases of annual production. The newest vineyard is The Cottage, which opened in 2012 and completed its first plantings of 4.58 acres in 2014. Blackstock Vineyard, which declared bankruptcy in 2013, has recently been purchased and will reopen shortly.

Predominant grapes of the Dahlonega Plateau AVA are *Vitis vinifera* varieties, of which there are 92.73 acres under cultivation, accounting for 84.0% of the total plantings. The most common *vinifera* varieties are Merlot (14.65 acres), Cabernet Sauvignon (12.93 acres), and Chardonnay (11.90 acres). Three varieties of hybrid grapes are grown of which Vidal Blanc is the most common (6.40 acres), followed by Seyval Blanc (2.08 acres). Cynthiana-Norton is the sole variety of American grape presently under cultivation (8.69 acres).

All seven of the vineyards have wine production facilities with individual wineries producing 1,000 to over 10,000 cases annually. Total annual production is estimated to be in excess of 18,000 cases.

Vineyard	Map Code	Address	Owners	Website
Blackstock Vineyards	1	5400 Town Creek Rd., Dahlonega, GA 30533	Johnny Ariemma & Wm. Werkheiser,	Under development
Cavender Creek Vineyards	2	3610 Cavender Creek Rd., Dahlonega, GA 30533	Raymond & Donna Castleberry	www.cavandercreekvineyards.com/?catchwine.com
Frogtown Cellars	3	700 Ridge Point Drive, Dahlonega, GA 30533	Craig Kritzer	www.frogtownwine.com
Montaluce Winery	4, 5	946 Via Montaluce, Dahlonega, GA 30533	Toll Bros./ Gibraltar Group	www.montaluce.com
The Cottage Vineyard & Winery	6	5050 US Hwy 129, Cleveland, GA 30528	Jim & Sandra Penner	www.cottagevineyardwinery.com
Three Sisters Vineyards	7	439 Vineyard Way, Dahlonega, GA 30533	Doug & Sharon Paul	www.threesistersvineyards,com
Wolf Mountain Vineyards	8	180 Wolf Mountain Trail, Dahlonega, GA 30533	Karl Boegner	www.wolfmountainvineyards.com

Table 2: Vineyards and operators in the proposed Dahlonega Plateau AVA.

[13] Montaluce Winery has vineyards in two locations, accounting for the eighth vineyard.

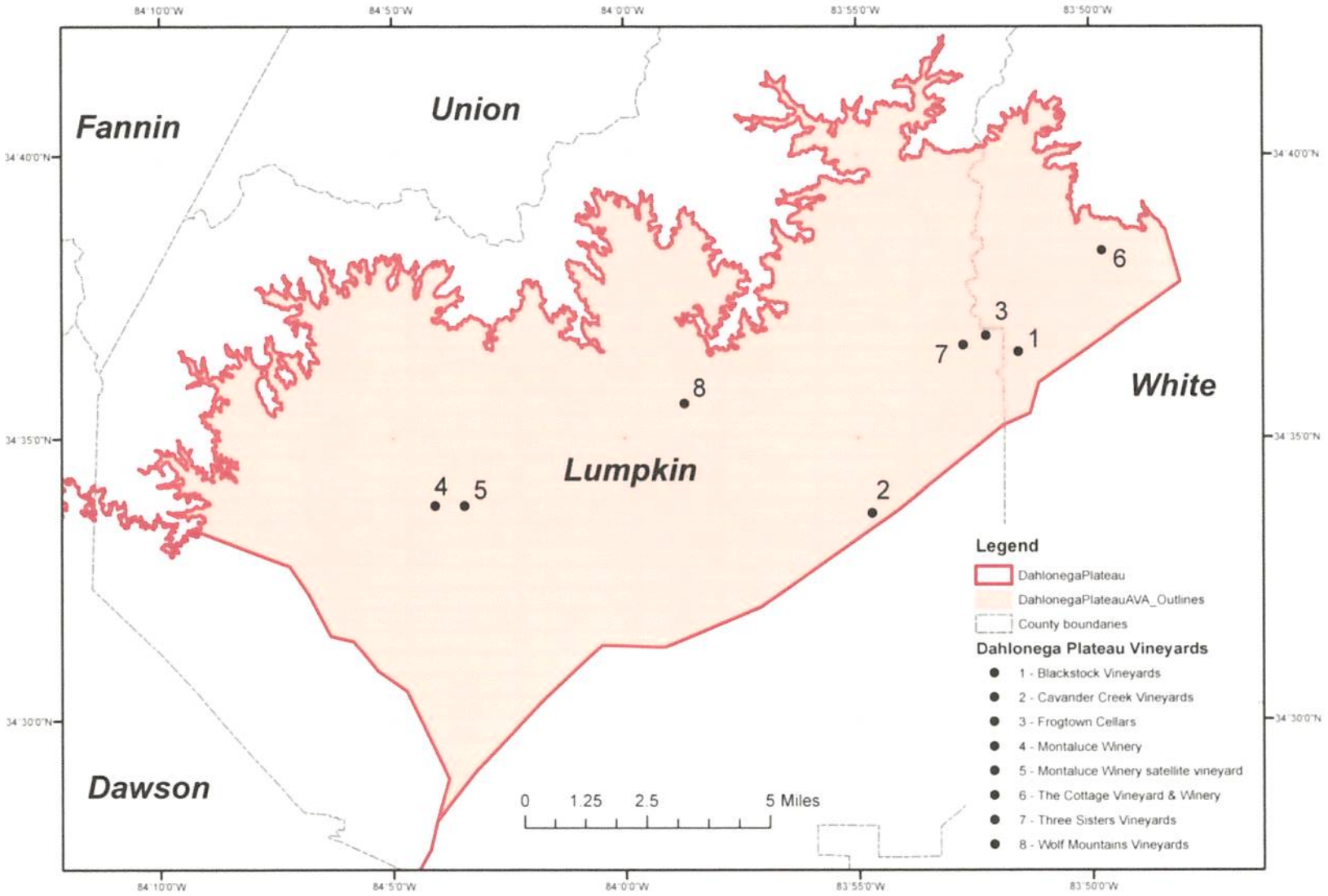

Figure 5. Commercial vineyards of the proposed Dahlonega Plateau AVA.

Grape Varieties	*Cultivar*	*Vineyards and Acreages*							
		Blackstock	Cavender Creek	Frogtown	Montaluce	The Cottage	Three Sisters	Wolf Mountain	Totals (Acres)
Cabernet Franc	*V. vinifera*		0.13	3.60	0.90		4.67		9.30
Cabernet Sauvignon	*V. vinifera*	4.2	1.42	4.30			1.29	1.72	12.93
Carmenere	*V. vinifera*			1.10					1.10
Chambourcin	Hybrid			0.45					0.45
Chardonnay	*V. vinifera*	3.7		4.30	1.70	0.65	1.55		11.90
Cythiana-Norton	American		1.18	3.25			4.26		8.69
Marsanne	*V. vinifera*			1.10					1.10
Malbec	*V. vinifera*			1.30	0.30			0.21	1.81
Merlot	*V. vinifera*	5.09		5.30		1.43	2.83		14.65
Moscat Blanc	*V. vinifera*					0.26			0.26
Mourvedre	*V. vinifera*							0.41	0.41
Nebbiola	*V. vinifera*			0.80					0.80
Petit Manseng	*V. vinifera*		1.03	1.10					2.13
Petit Verdot	*V. vinifera*			2.15	0.36				2.51
Pinot Blanc	*V. vinifera*						1.06		1.06
Pinot Gris	*V. vinifera*				1.24				1.24
Pinot Noir	*V. vinifera*						1.10		1.10
Rousanne	*V. vinifera*			0.70					0.70
Sangiovese	*V. vinifera*	2.87		2.10	0.80				5.77
Sauvignon Blanc	*V. vinifera*			0.80					0.80
Sauvignon Gris	*V. vinifera*			1.30					1.30
Seyval Blanc	Hybrid			0.70	1.38				2.08
Syrah	*V. vinifera*					0.84		0.74	1.58
Tannat	*V. vinifera*			2.80				1.03	3.83
Teroldego	*V. vinifera*			1.10					1.10
Touriga Nacional	*V. vinifera*	4.43	0.11	1.75			0.52	0.59	7.40
Vernaccia	*V. vinifera*			0.10					0.10
Vidal Blanc	Hybrid			0.90	2.38		3.12		6.40
Viognier	*V. vinifera*	3.84	0.11	2.50		1.40			7.85
Totals (acres)		**24.13**	3.98	43.50	9.06	4.58	20.40	4.70	110.35
Future Acres (presently undeveloped)		**8.51**			2.84			0.58	11.93
V. vinifera		24.13	2.80	38.20	5.30	4.58	13.02	4.70	92.73
Hybrid				2.05	3.76		3.12		8.93
American			1.18	3.25			4.26		8.69
Totals (acres)		24.13	3.98	43.50	9.06	4.58	20.40	4.70	110.35

Table 3. Vineyards, grape varieties, and acreages in the proposed Dahlonega Plateau AVA.

5) Distinguishing Characteristics

a) Introduction

The most important distinguishing characteristics of the Dahlonega Plateau revolve around its elevation and geomorphology, which play a major role in controlling the proposed AVA's climate, including temperature and precipitation, and length of growing season, which differ markedly from those of surrounding areas to the north, east, south and west. In analyzing these distinguishing characteristics we have utilized a variety of publically available datasets. The most important and basic data is a Digital Elevation Model (DEM)[14] obtained from the website of the US Geological Survey's National Map Viewer and Download Platform. In addition we have made use of 1981-2010 climate normals for individual weather monitoring stations downloaded from the website of the National Climatic Data Center,[15] as well as the 1981-2010 gridded climate normals generated by the Prism Climate Group at Oregon State University.[16] County and State boundary data was obtained through the website of the US Bureau of the Census.[17] Outlines of National Forest areas in northern Georgia were obtained from the US Department of Agriculture's Chattahoochee-Oconee National Forest website.[18] Outlines of watersheds surrounding the area of analysis were downloaded from the USGS's Watershed Boundary Dataset.[19] All datasets were processed and analyzed using ESRI's ArcGIS 10.1[20] software and its Spatial Analyst extension.

b) Definition of Comparison Areas

The areas surrounding the proposed AVA comprise a number of physiographic provinces that display variability in elevation and geomorphology (Clark and Zisa, 1976). West of the proposed AVA the Dahlonega Plateau descends in elevation to its convergence with the Hightower and Jasper Ridges north of the town of Canton, GA. The boundary between the southwestern portion of the Dahlonega Plateau and the proposed AVA is drawn along a line that closely parallels a major geological boundary, which we discuss in more detail in a later section. The southwestern extension of the Dahlonega Plateau, which we refer to as our west comparison area, differs distinctly in its viticultural environments from the proposed AVA to its northeast.

To delimit the north, south and east comparison areas we have utilized the boundaries of watersheds that surround the proposed AVA on those sides (Figure 6), going out a sufficient

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[14] A Digital Elevation Model, or DEM, is a regularly-gridded surface in which each grid center contains an elevation value, thus displaying the topography of an area in a regular pattern of distribution. DEMs downloaded from the USGS are delivered as raster images or as files that can be converted to raster formats for analysis in Geographic Information System (GIS) software.

[15] http://www.ncdc.noaa.gov/data-access/land-based-station-data

[16] http://www.prism.oregonstate.edu/

[17] http://www.census.gov/geo/maps-data/data/tiger-cart-boundary.html

[18] http://www.fs.usda.gov/main/conf/landmanagement/gis

[19] http://nhd.usgs.gov/wbd.html

[20] ArcGIS 10.1 and the Spatial Analyst extension are registered trademarks of Environmental Systems Research Institute (ESRI), 380 New York Street, Redlands, CA 92373-8100.

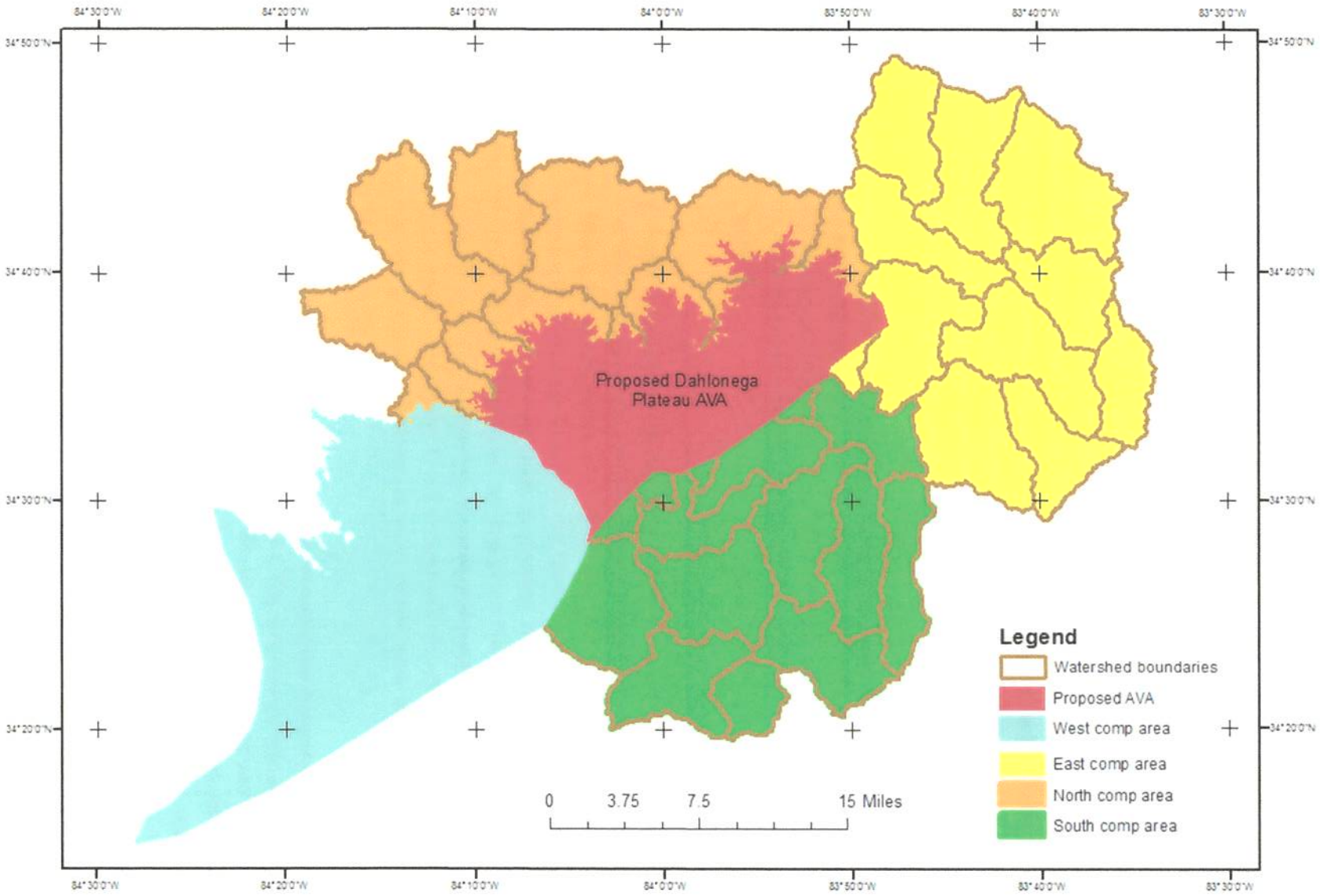

Figure 6. Dahlonega Plateau region illustrating watershed boundaries that define the north, east and south comparison areas.

distance to demonstrate differences in viticultural environments and using the outer limits of the watersheds as the outer limits of the comparison areas.

Within the north, south and east comparison areas there are several physiographic provinces delineated by Clark and Zisa (1976); the relationship of these features to the comparison areas is illustrated in Figure 7. The north comparison area consists of the Blue Ridge Mountains that border the entire north side of the Dahlonega Plateau. The boundary between the Dahlonega Plateau and Blue Ridge Mountains has been placed along the 1800-foot topographic contour, which approximates a major break in slope along the south face of the higher mountains. The north side of the east comparison area consists of the continuation of the Blue Ridge Mountains, followed to the south by the Hightower Ridges, which are succeeded to the south by the Central Uplands. The south comparison area comprises the Hightower Ridges along the southern margin of the Dahlonega Plateau, followed to the south by the Central Uplands province.

In our comparison of features surrounding the proposed AVA we have focused on elevation differences, mean annual temperatures, mean growing season temperatures, estimated length of growing season, mean annual precipitation, and geomorphology. Sixteen profiles have been drawn across the comparison areas that demonstrate the dependent relationship between these characteristics (Figure 9).

c) Elevation

Elevation is a key factor in the viticultural environment of the Dahlonega Plateau because of its relationship to the area's temperature, precipitation, and length of growing season, which are critical climate factors for grape cultivation. As in all mountainous regions of the world, temperatures and length of growing season in the Dahlonega region tend to decrease with increasing elevation while precipitation tends to increase (Forrest, 2013). To demonstrate topographic differences between the various terrains of the Dahlonega region we have utilized the Digital Elevation Model (Figure 8) from the US Geological Survey to calculate mean values of elevation for each comparison area (Table 4) and to construct 16 cross-sections that demonstrate graphically the intimate relationship between elevation, temperature, and precipitation. (Figures 10, 11, 12 and 13).

The range in elevation for the entire comparison area, including the proposed AVA, is 856.6 feet at its lowest point up to 4460.2 feet at the highest point. The north comparison area is the highest area surrounding the proposed AVA with a mean elevation of 2455.4 feet, and it contains the highest point of all of the comparison areas; it forms a steep, rugged wall along the north boundary of the proposed AVA marked by a noticeable change in slope at approximately

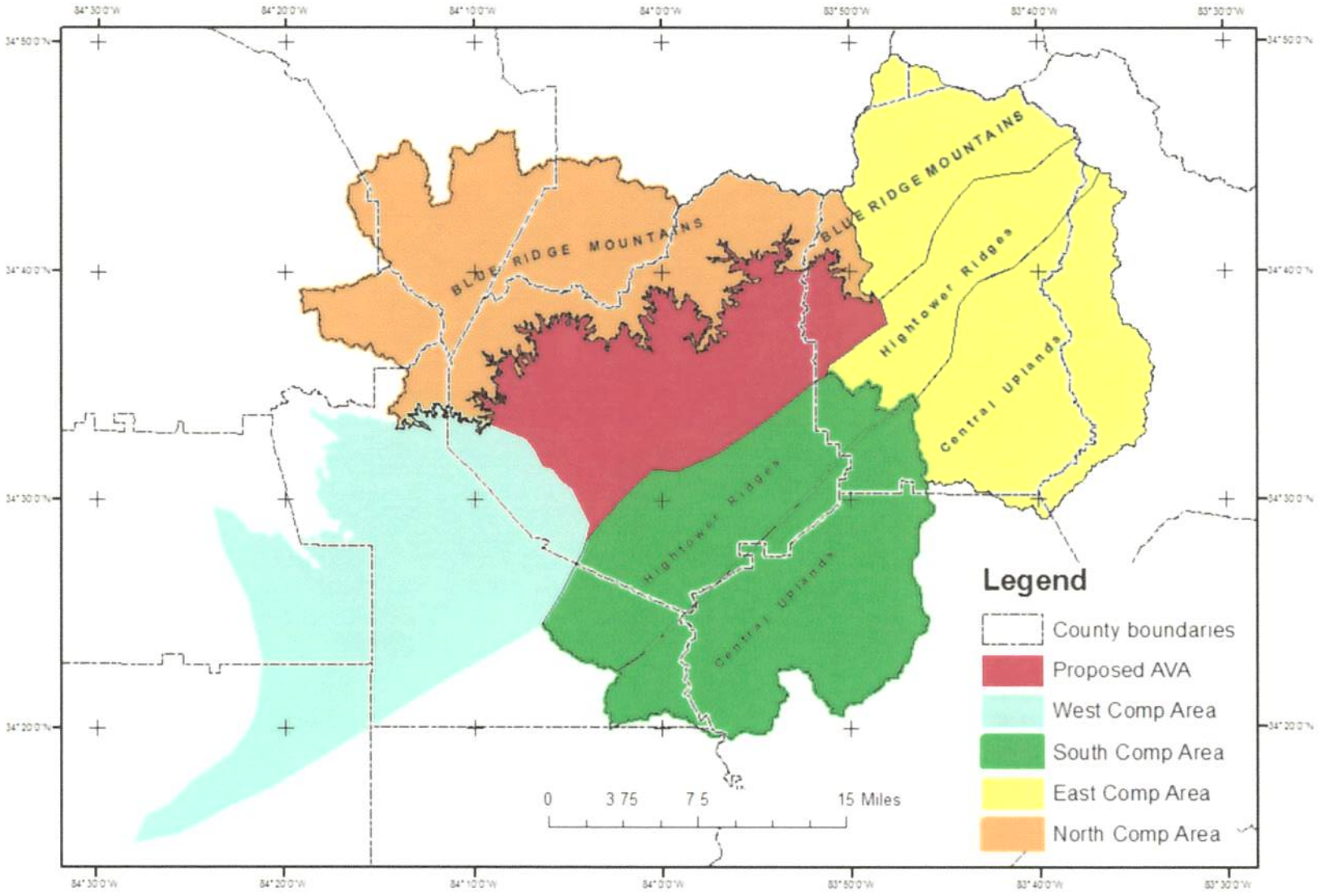

Figure 7. Dahlonega Plateau region illustrating comparison areas and physiographic features within them.

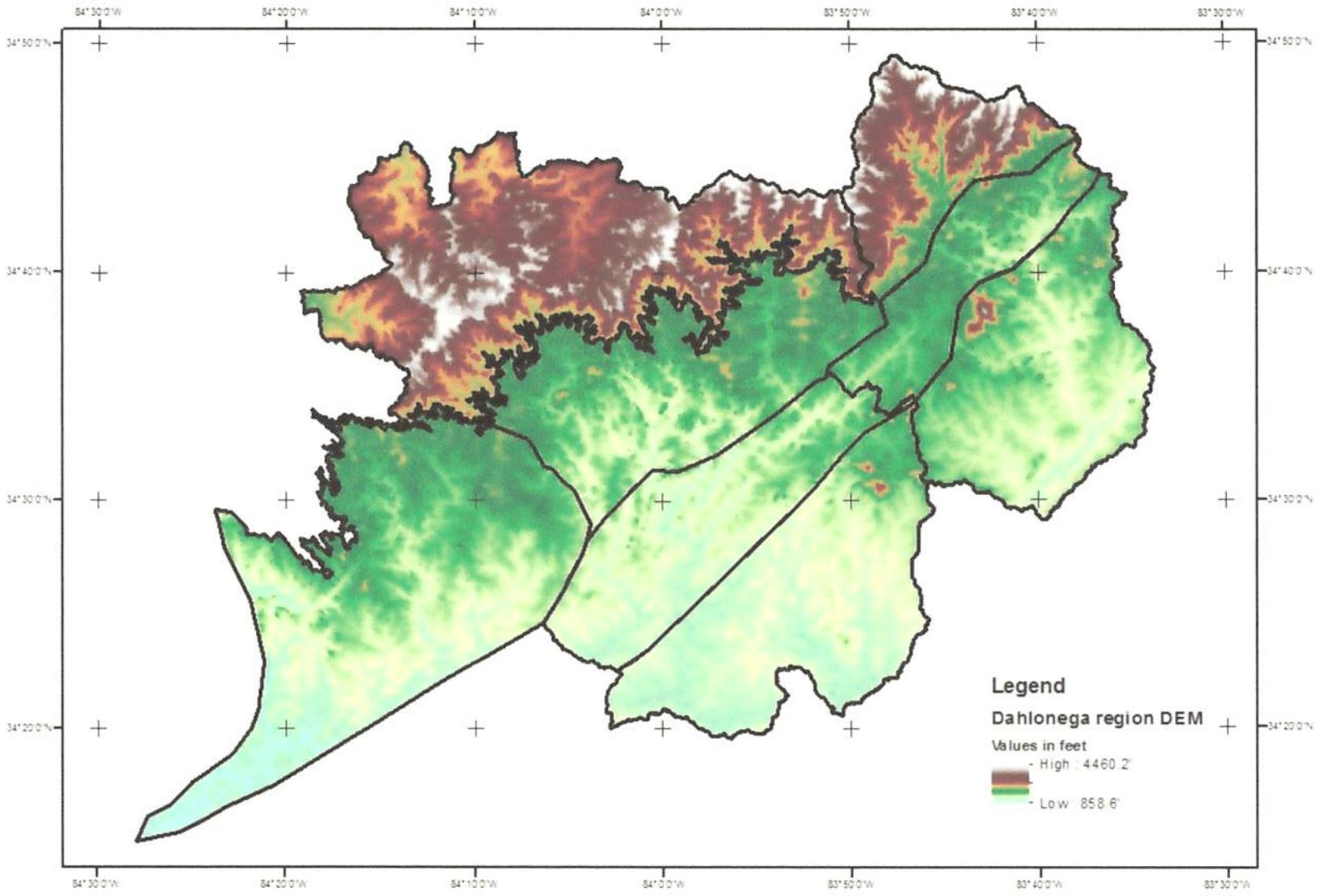

Figure 8. Outlines of the proposed Dahlonega Plateau AVA and surrounding comparison areas overlain on a digital elevation model illustrating topographic variation across the area. See Figure 7 to identify comparison areas.

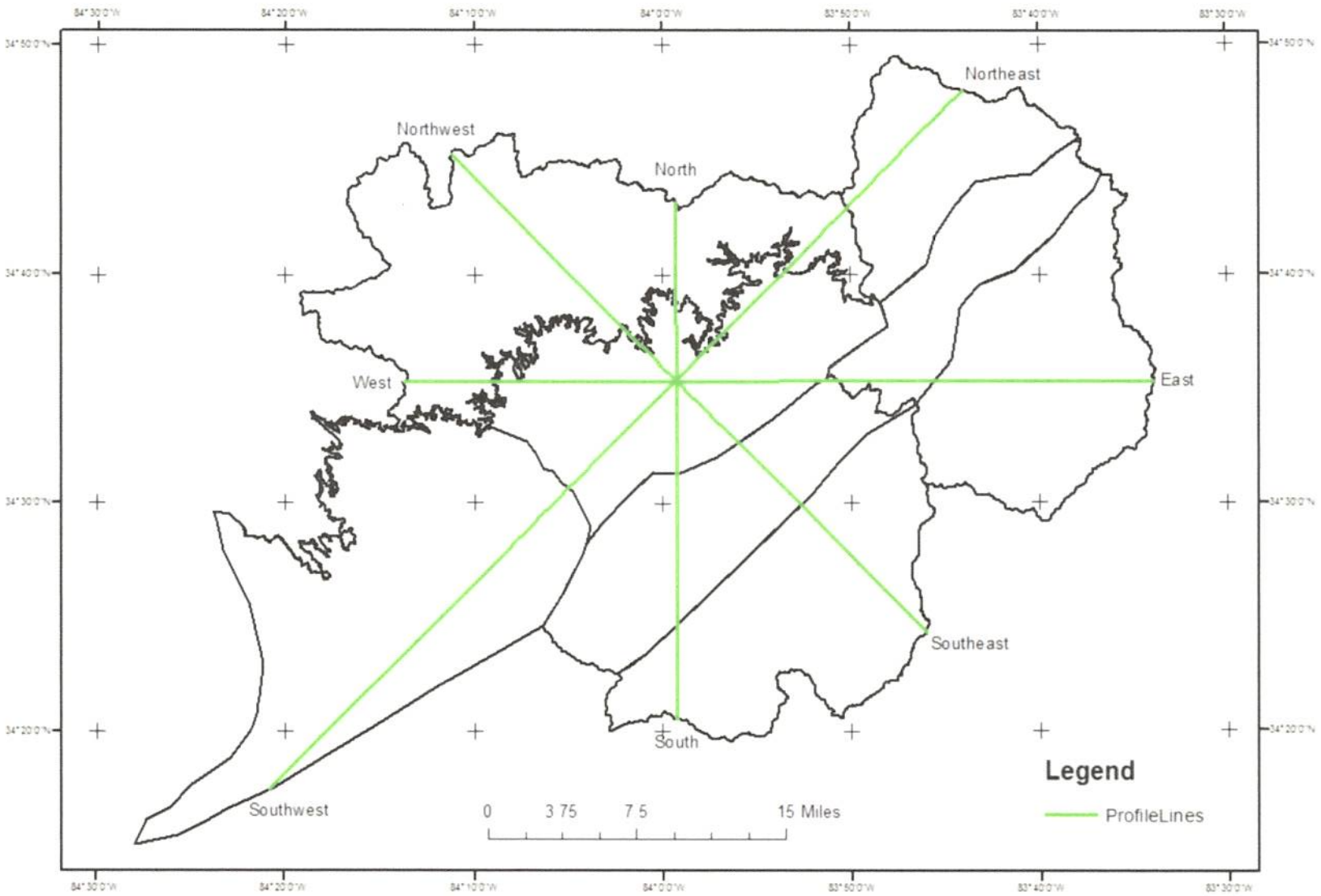

Figure 9 Locations of elevation, temperature, precipitation and growing season profiles across the Dahlonega region comparison areas The profiles meet at the centroid point of the proposed AVA

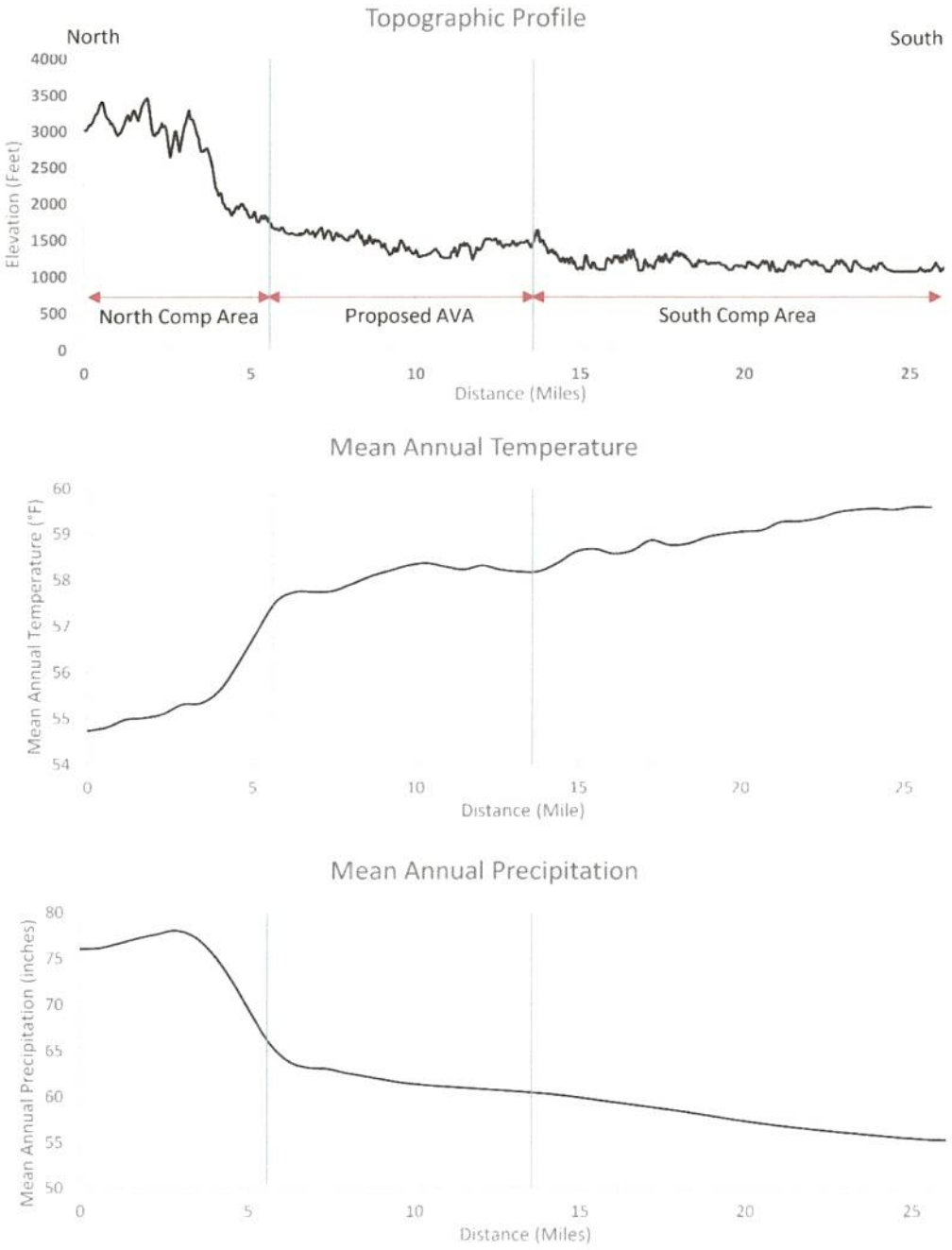

Figure 10. North-south profiles of topography, mean annual temperature, and mean annual precipitation across the Dahlonega region comparison areas.

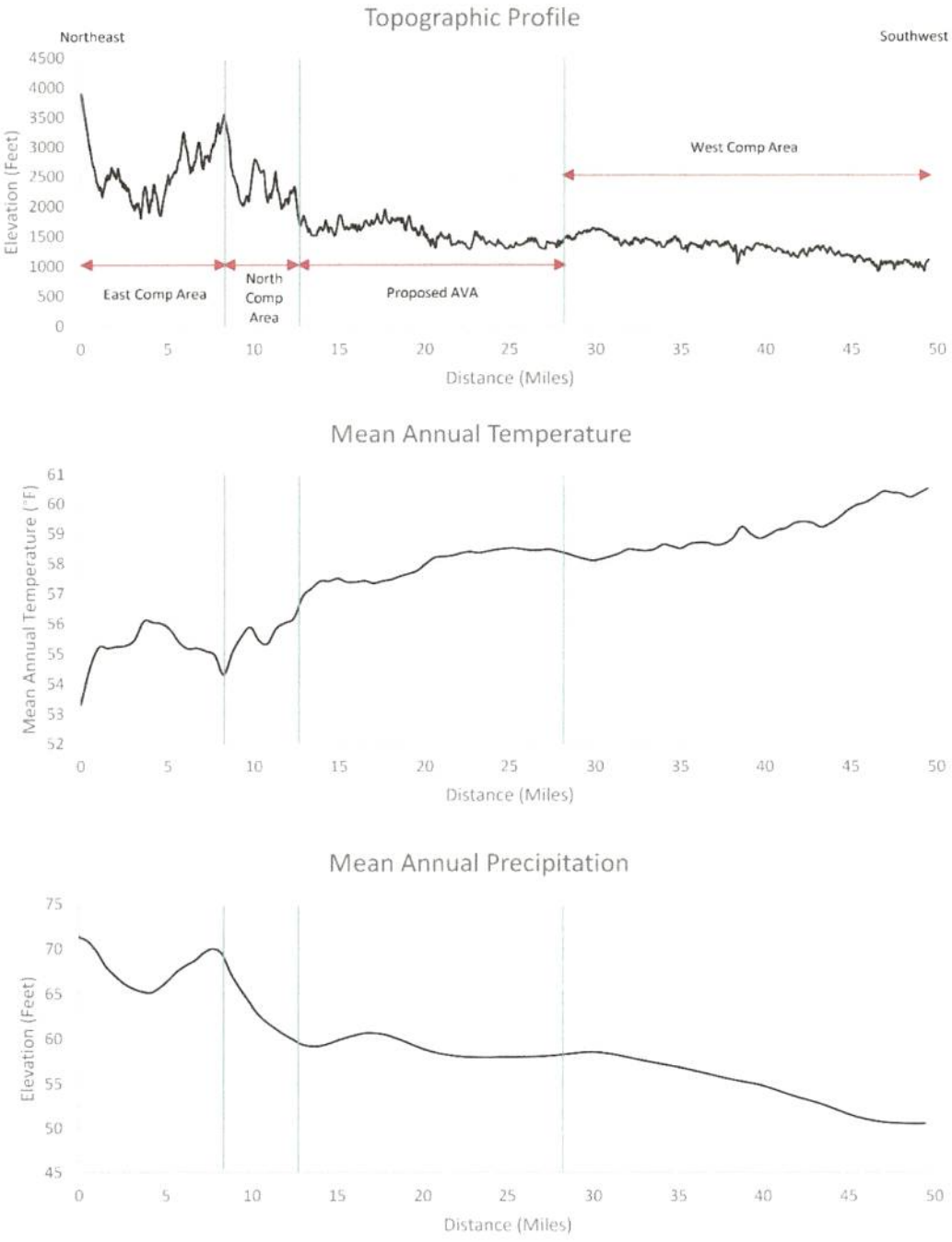

Figure 11. Northeast-southwest profiles of topography, mean annual temperature, and mean annual precipitation across the Dahlonega region comparison areas.

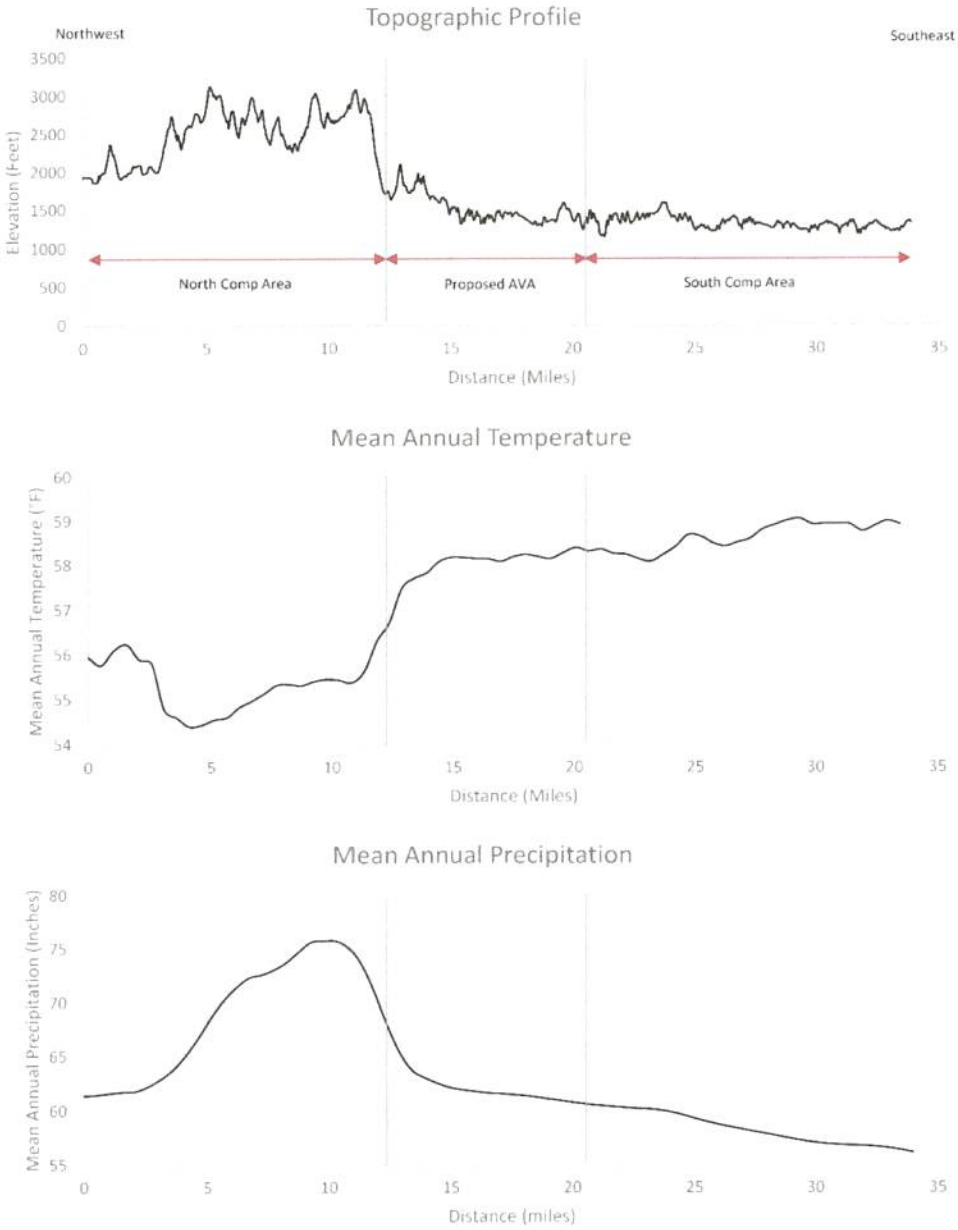

Figure 12. Northwest-southeast profiles of topography, mean annual temperature, and mean annual precipitation across the Dahlonega region comparison areas.

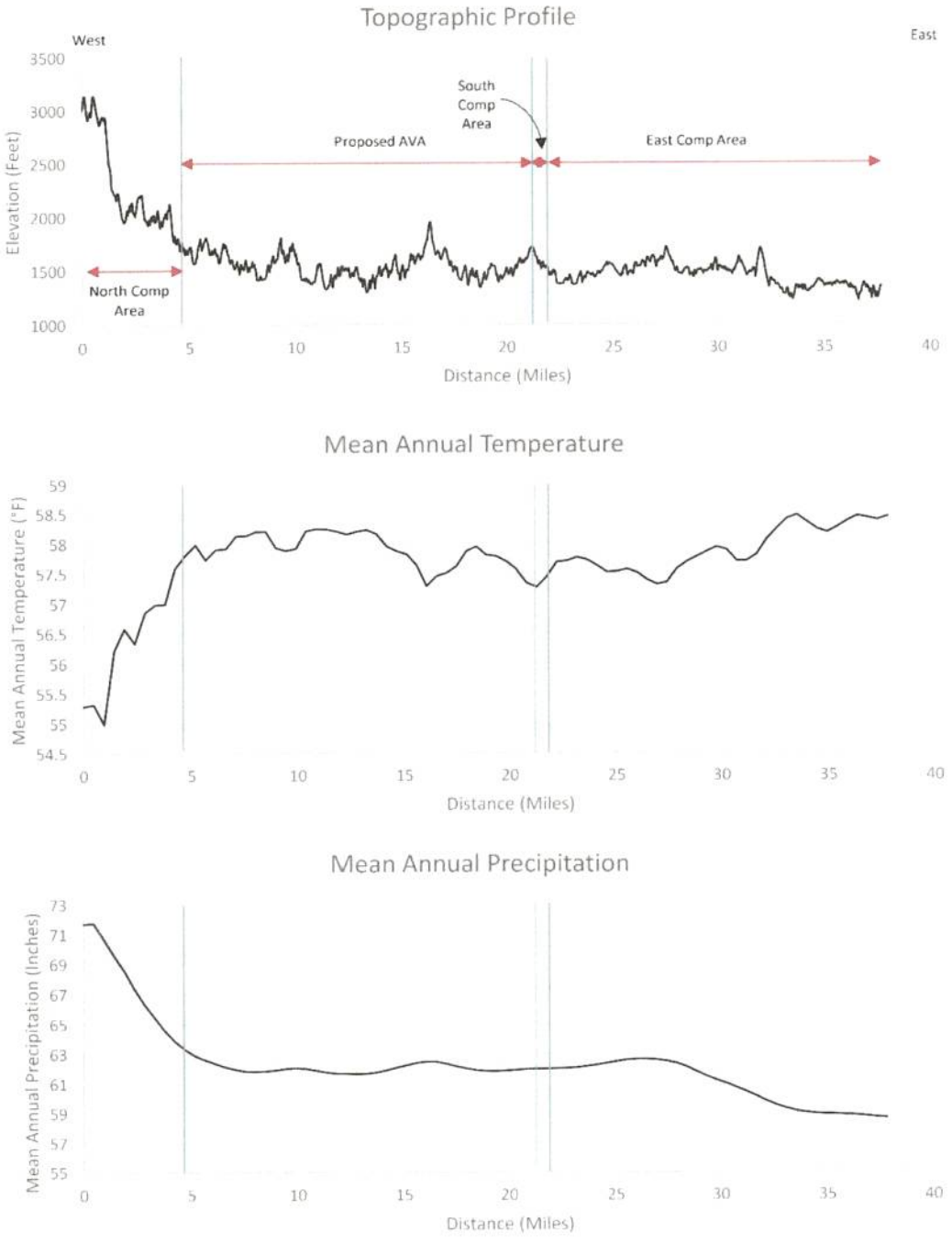

Figure 13. West-east profiles of topography, mean annual temperature, and mean annual precipitation across the Dahlonega region comparison areas.

the 1800-foot topographic contour, which marks the boundary between the north comparison area and the proposed AVA. Based on a mean elevation of 1771.0 feet the east comparison area is the second highest areas surrounding the proposed AVA, 684.4 feet lower than the north area and averaging 215.5-489.6 feet higher than the other areas. The proposed AVA occupies an intermediate topographic – lower than the areas to the north and east and higher than the areas to the south and west. These relationships can be clearly seen in the topographic profiles in Figures 9, 10, 11 and 12.

Terrain	Elevation Parameters (Feet above mean sea level)		
	Minimum	Maximum	Mean
Proposed AVA	1141.7	2345.8	1554.2
North Comp Area	1651.7	4460.2	2455.4
East Comp Area			
Blue Ridge Mtns.	*1441.1*	*4418.8*	*2449.6*
Hightower Ridges	*1317.1*	*2386.4*	*1565.2*
Central Uplands	*1088.2*	*3164.5*	*1446.5*
South Comp Area			
Hightower Ridges	*1053.3*	*2180.8*	*1315.0*
Central Uplands	*1069.5*	*2584.4*	*1256.8*
West Comp Area	858.6	2033.2	1386.3

Table 4. Comparison of elevation parameters in the proposed AVA and surrounding comparison terrains. Italicized terrains are physiographic components of the east and south comparison areas.

In the north-south, northeast-southwest and northwest-southeast topographic profiles (Figures 10, 11, and 12, respectively) the slope of the proposed AVA is clearly seen descending south and southeast from the steep front of the Blue Ridge Mountains of the north and east comparison areas. This same southward slope continues across the south, west and east comparison areas, placing the proposed AVA in an intermediate topographic position between the high Blue Ridge Mountains to the north and east and the lower elevation terrains to the south, west and east. The west-east section (Figure 13) crosses the proposed AVA and the Hightower Ridges of the east comparison area and demonstrates the similar elevation situation of the two areas along the line of section, descending at the end of the profile into the lower elevation Central Uplands. The intermediate topographic position of the proposed Dahlonega Plateau AVA has important implications for distinguishing the area from surrounding terrains; just as the proposed AVA has an intermediate elevation position, its temperature, precipitation, and length of growing season have intermediate values when compared to surrounding areas.

d) Temperature

The importance of temperature as a climatic factor for grape cultivation is that it determines the length of a region's growing season and which types of grapes, if any, can be grown there. Temperature in mountainous terrains tends to decrease with increasing elevation, and mean annual temperatures on the Dahlonega Plateau and in surrounding areas show differences that

can be correlated with the significant topographic variations of the region. Data for our analysis is from gridded climate normals generated by the Prism Climate Group at Oregon State University for the 30-year period from 1981-2010 (Table 5 and Figure 14).

The range of mean annual temperatures of the whole of the comparison areas, including the proposed AVA, is 51.5 – 60.6°F. The lowest mean annual temperatures occur in the highest elevation regions (Blue Ridge Mountains) to the north and east of the proposed AVA, while the highest mean annual temperatures occur in the lower elevation terrains to the south and west (Table 5). The proposed AVA has a mean annual temperature that is intermediate in value between the higher and lower elevation regions. This relationship is well demonstrated on the mean annual temperature profiles in Figures 10, 11, 12 and 13. An intermediate range of mean temperatures is not only valid on an annual basis for the proposed AVA, it also is true for any month and season of the year.

Terrains	Mean Annual Temperature Parameters (°F)		
	Minimum	Maximum	Mean
Proposed AVA	55.6	58.6	57.6
North Comp Area	52.2	58.1	55.6
East Comp Area			
Blue Ridge Mtns.	*53.7*	*57.6*	*55.7*
Hightower Ridges	*56.2*	*58.2*	*57.4*
Central Uplands	*57.2*	*59.0*	*57.9*
South Comp Area			
Hightower Ridges	*56.5*	*59.4*	*58.5*
Central Uplands	*56.2*	*59.9*	*59.0*
West Comp Area	56.9	60.6	58.8

Table 5. Comparison of mean annual temperatures for the proposed AVA and surrounding comparison areas. The terrains shown in italics are physiographic components of the respective comparison areas.

A very important temperature metric for viticulture is diurnal variation. During the day when temperatures are warmest grapevines are producing good flavor compounds. Under ideal conditions nighttime temperature should cool off to slow down metabolism and keep the flavor compounds concentrated in the grape. In some warm-temperature viticulture regions the diurnal temperature variation is not enough to slow metabolism and flavor compounds are destroyed with continuing nighttime metabolic activity. To evaluate diurnal temperature variations in the Dahlonega region we have again utilized the 1981-2010 gridded temperature normals generated by the Prism Climate Group at Oregon State University. Two datasets from Prism have been used: mean minimum and mean maximum temperatures for the month of July, the warmest month of the Dahlonega region's growing season. The mean minimum temperature data represents nighttime temperature of the region, while the mean maximum represents daytime temperatures.

The greatest diurnal temperature variations occur in the east and south comparison areas, while the least variation occurs in the Blue Ridge Mountains of the east comparison area (Table 6). The

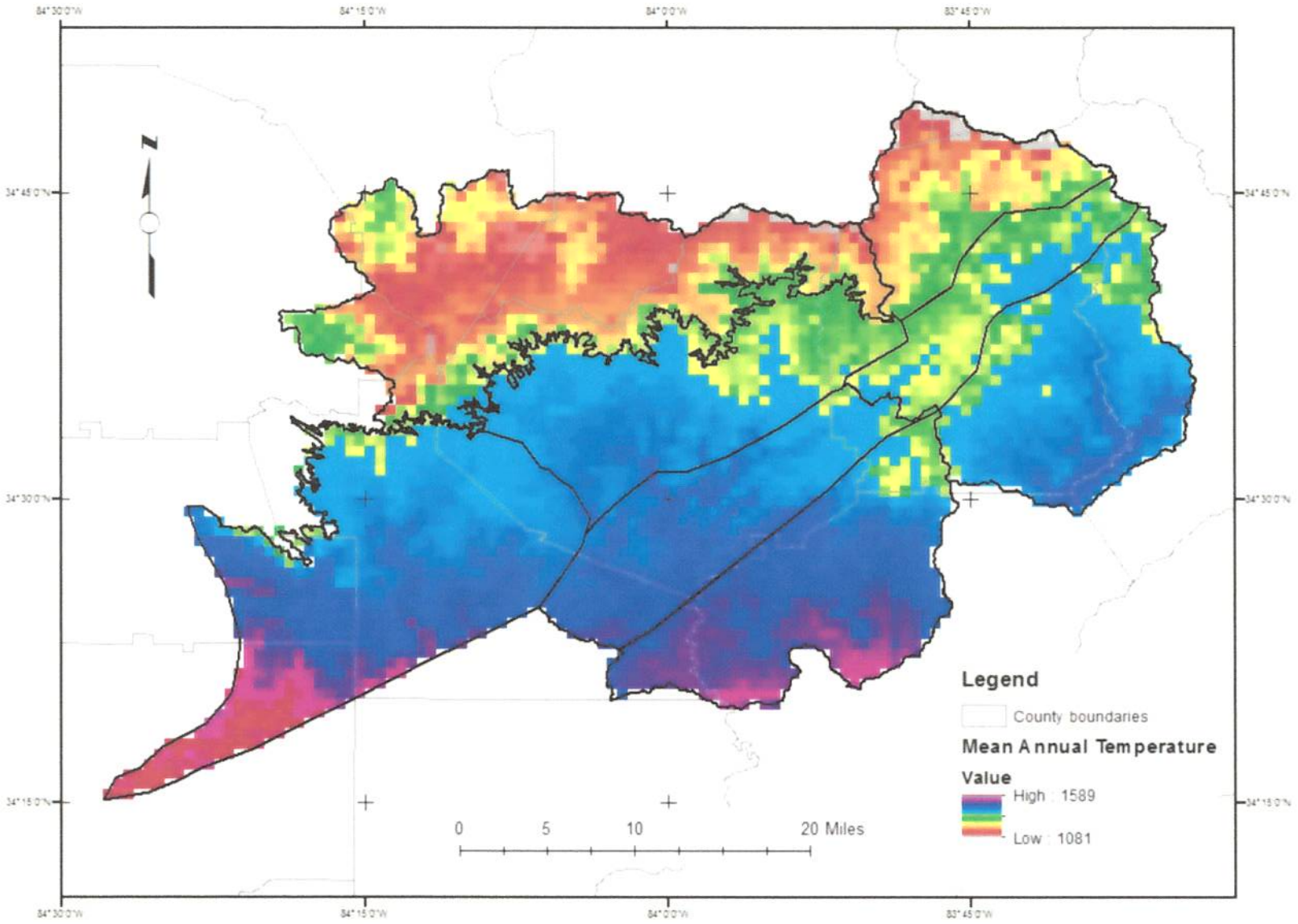

Figure 14: Mean annual temperature distribution in the proposed Dahlonega Plateau AVA and surrounding comparison areas.

implication of this relationship confirms that the highest elevations of the terrains surrounding proposed AVA are the coolest, with lower elevation terrains being the warmest. As with elevation and mean annual temperature the diurnal temperature variation in the proposed AVA is intermediate in value.

Mean maximum diurnal temperature is also an important factor in distinguishing the terrains of the Dahlonega region. At a temperature of 85°F photosynthesis ceases in grapevines and ripening of the berries is shut down. This results in a prolongation of the ripening process, and, if temperatures remain at the 85°F level or greater for long periods of time, total ripening of the berries may not occur. As a result grapes may have to be harvested with less than the optimum sugar content to produce a desired alcohol level for the wine variety. With the exception of the Blue Ridge Mountains of the north and east comparison areas the terrains surrounding and including the proposed AVA all run the risk of exceeding the 85°F threshold during the critical month of July (Table 6).

Terrains	Mean Min & Max July Temperatures (°F)		
	Minimum (nighttime)	Maximum (daytime)	Diurnal Difference
Proposed AVA	64.7	86.0	21.3
North Comp Area	62.6	82.7	21.5
East Comp Area			
Blue Ridge Mtns.	*63.4*	*83.4*	*19.0*
Hightower Ridges	*63.9*	*86.2*	*22.3*
Central Uplands	*64.8*	*86.7*	*21.9*
South Comp Area			
Hightower Ridges	*63.5*	*86.8*	*23.3*
Central Uplands	*65.8*	*87.3*	*21.5*
West Comp Area	66.2	87.7	21.5

Table 6. Comparison of diurnal temperature variations in the proposed AVA and surrounding comparison areas and of maximum (daytime) temperatures.

Though the mean daytime temperature of the proposed AVA does exceed the 85°F threshold by one degree, it is the least excessive of all the terrains surrounding it; lower elevation terrains in the east, south and west comparison areas exceed the mean daytime temperature of the proposed AVA by 0.2 to 1.7°F during July and thus run a higher risk of interrupted photosynthesis during the growing season.

e) Growing Season

Growing season is defined as the number of days between the last 28°F temperature (the temperature at which plant tissue freezes) in the spring and the first occurrence of that temperature in the fall.[21] To estimate variations in length of growing season in the Dahlonega region we have utilized 1981-2010 climate normals for 22 weathering monitoring stations within the comparison areas and surroundings (Figure 15 and Table 7). The National Climate Data Center

[21] "Vineyard Site Evaluation." *Vineyard Site Evaluation*. N.p., n.d. Web. 16 Nov. 2014. http://arcserver2.iagt.org/vll/learnmore.aspx

(NCDC) has calculated the mean number of frost-free days for each of these stations based on a threshold temperature of 28°F. We have plotted the number of frost-free days versus elevation at these stations fitted a linear trend to the plotted points, and calculated the equation of this trend (Figure 16). Using elevation values within each of the comparison areas and the equation relating number of frost-free days to elevation we have estimated the minimum, maximum and mean length of the growing season for each of the comparison areas (Figure 17 and Table 8). Four profiles have been prepared to show the variability of growing season across the comparison areas (Figure 18) and demonstrate how the length of growing season varies across the comparison areas.

NCDC Station Name	Latitude	Longitude	Elevation (Ft)	Year Measured	Growing Season (Days)
Allatoona Dam 2 GA	34.165	-84.73	975.1	2010	220
Alpharetta 4 SSW GA	34.10139	-84.35056	1138.1	2010	212
Alto 4 SE GA	34.4416	-83.5161	918.0	2010	211
Atlanta Dekalb Peachtree Airport GA	33.875	-84.30222	1001.6	2010	235
Blairsville Experimental Station GA	34.8544	-83.9444	1949.1	2010	174
Cartersville Airport GA	34.12306	-84.84861	763.1	2010	206
Cartersville GA	34.2043	-84.7925	789.0	2010	203
Chatsworth 2 GA	34.7589	-84.765	709.0	2010	207
Clayton 1 SSW GA	34.8619	-834063	1915.0	2010	177
Commerce 4 NNW GA	34.2625	-83.48944	750.0	2010	215
Cornelia GA	34.5181	-83.5286	1470.1	2010	213
Coweeta Experiment Station NC	35.05917	-83.43139	2249.0	2010	170
Dahlonega GA	34.52917	-83.99	1560.0	2010	189
Dallas 7 NE GA	33.98806	-84.7475	1100.1	2010	209
Franklin NC	35.1802	-83.3925	2125.0	2010	166
Gainesville GA	34.3006	-83.86	1169.9	2010	234
Gainesville Lee Gilmer Mem Airport GA	34.27194	-83.83028	1274.9	2010	244
Helen GA	34.6996	-83.7261	1493.1	2010	182
Jasper 1 NNW GA	34.47583	-84.44611	1464.9	2010	215
Murphy 4 ESE NC	35.09611	-84.02389	1576.1	2010	180
Sautee 3 W GA	34.6646	-83.7342	1590.9	2010	187
Toccoa GA	34.5786	-83.3319	1012.1	2010	222

Table 7. National Climate Data Center weather monitoring stations used in growing season analysis.

The total range of growing season length in the comparison areas and proposed AVA is 159 to 212 days. The terrain with the greatest range of growing season is the east comparison area, with a total range of 95 to 211 days, reflecting the great range of elevation in the area and its diversity of physiography. The area with the longest growing season is the southwest extension of the west comparison area with a maximum of 219 days, while the areas with the shortest mean growing season are the Blue Ridge Mountains of the north and east comparison areas. The proposed AVA and the Hightower Ridges of the east comparison area have a mean length of growing season of 195 days, which is intermediate between the high and low values of the comparison terrains.

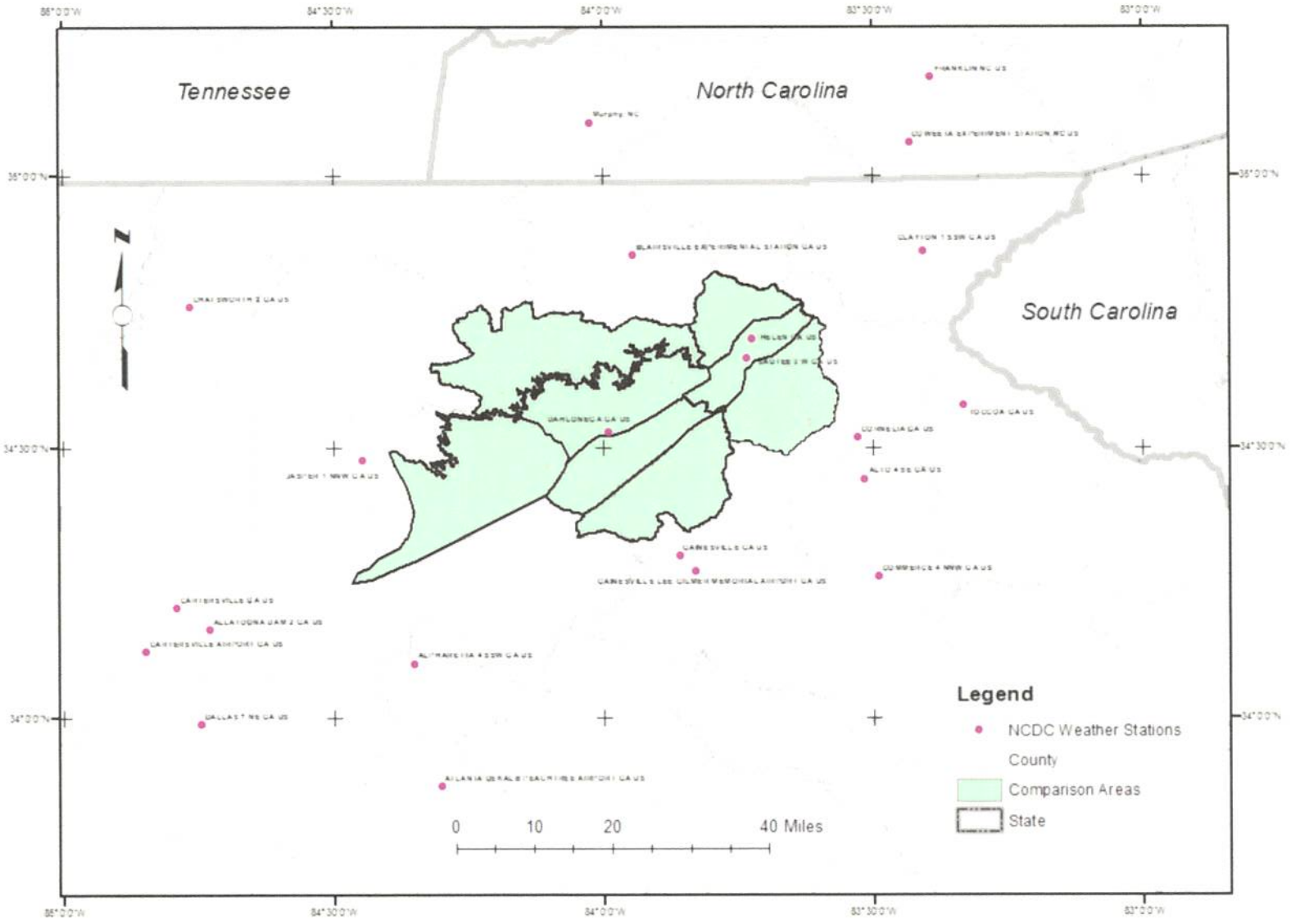

Figure 15: Location of NCDC weather monitoring stations used in growing season analysis.

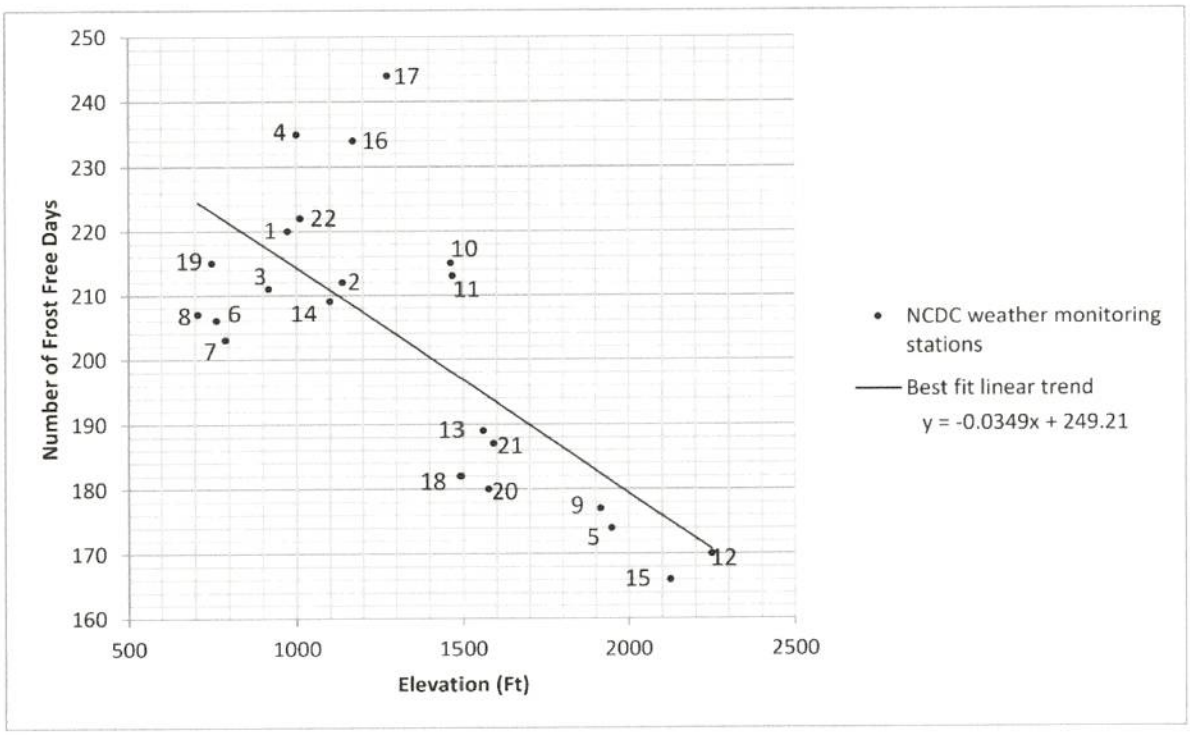

Figure 16. Plot of frost free days versus elevation from NCDC weather monitoring stations.

Terrains	Length of Growing Season (Days)		
	Minimum	Maximum	Mean
Proposed AVA	167	209	195
North Comp Area	94	192	164
East Comp Area	95	211	188
Blue Ridge Mtns.	*95*	*199*	*164*
Hightower Ridges	*166*	*203*	*195*
Central Uplands	*139*	*211*	*199*
South Comp Area	159	212	204
Hightower Ridges	*173*	*212*	*203*
Central Uplands	*159*	*211*	*205*
West Comp Area	178	219	201

Table 8. Length of growing season in the Dahlonega region comparison areas and proposed AVA.

The following guidelines for selecting vineyard sites based on growing season have been published by the College of Agriculture and Life Sciences at Cornell University in conjunction with the Institute for the Application of Geospatial Technologies:[22]

[22] "Vineyard Site Evaluation." *Vineyard Site Evaluation*. College of Agriculture and Life Sciences at Cornell University and the Institute for Application of Geospatial Technologies, n.d. Web. 16 Nov. 2014. <http://arcserver2.iagt.org/vll/>

<160 days	Sites not recommended, growing season too short to fully ripen wine grapes
>160 Days	Sites marginal – acceptable for earliest ripening varieties
>170 Days	Satisfactory sites
>180 Days	Good sites
>190 Days	Sites not limited by growing season
>200 Days	Sites better for longer season varieties of grapes

Using the above criteria the best sites for viticulture are those with a minimum growing season of 180 days. The predominant length of growing season in the proposed AVA and in the Hightower Ridges of the east comparison area is 190-200 days (Table 9 and Figure 17), while the predominant length of growing season in all other areas, with the exception of the north comparison area and the Blue Ridge Mountains of the east comparison area (both <160 days), is greater than 200 days; this is a reflection of the intermediate mean elevation of the proposed AVA and the Hightower Ridges of the east comparison area compared to the surrounding terrains. The proposed AVA and the Hightower Ridges of the east have lower mean temperatures than the Central Uplands of the east, the Hightower Ridges and the Central Uplands of the south, and the west comparison area, and they have higher temperatures than the Blue Ridge terrains of the north and east areas.

Terrains	Percentage of Terrains						
	<160	160-170	170-180	180-190	190-200	>200	%180+
Proposed AVA		0.02	0.33	19.40	60.82	19.43	99.66
North Comp Area	39.86	21.45	23.96	14.69	0.04		14.74
East Comp Area							
Blue Ridge Mtns.	44.04	16.90	14.32	16.39	8.35		24.74
Hightower Ridges		0.05	1.00	11.79	76.50	10.66	98.95
Central Uplands	0.25	0.40	1.07	5.02	44.62	48.63	98.28
South Comp Area							
Hightower Ridges			0.04	0.45	22.91	76.60	99.96
Central Uplands		0.07	0.49	1.40	9.84	88.19	99.44
West Comp Area			0.01	6.80	42.74	50.45	99.99

Table 9. Percentage of growing season lengths within each comparison terrain.

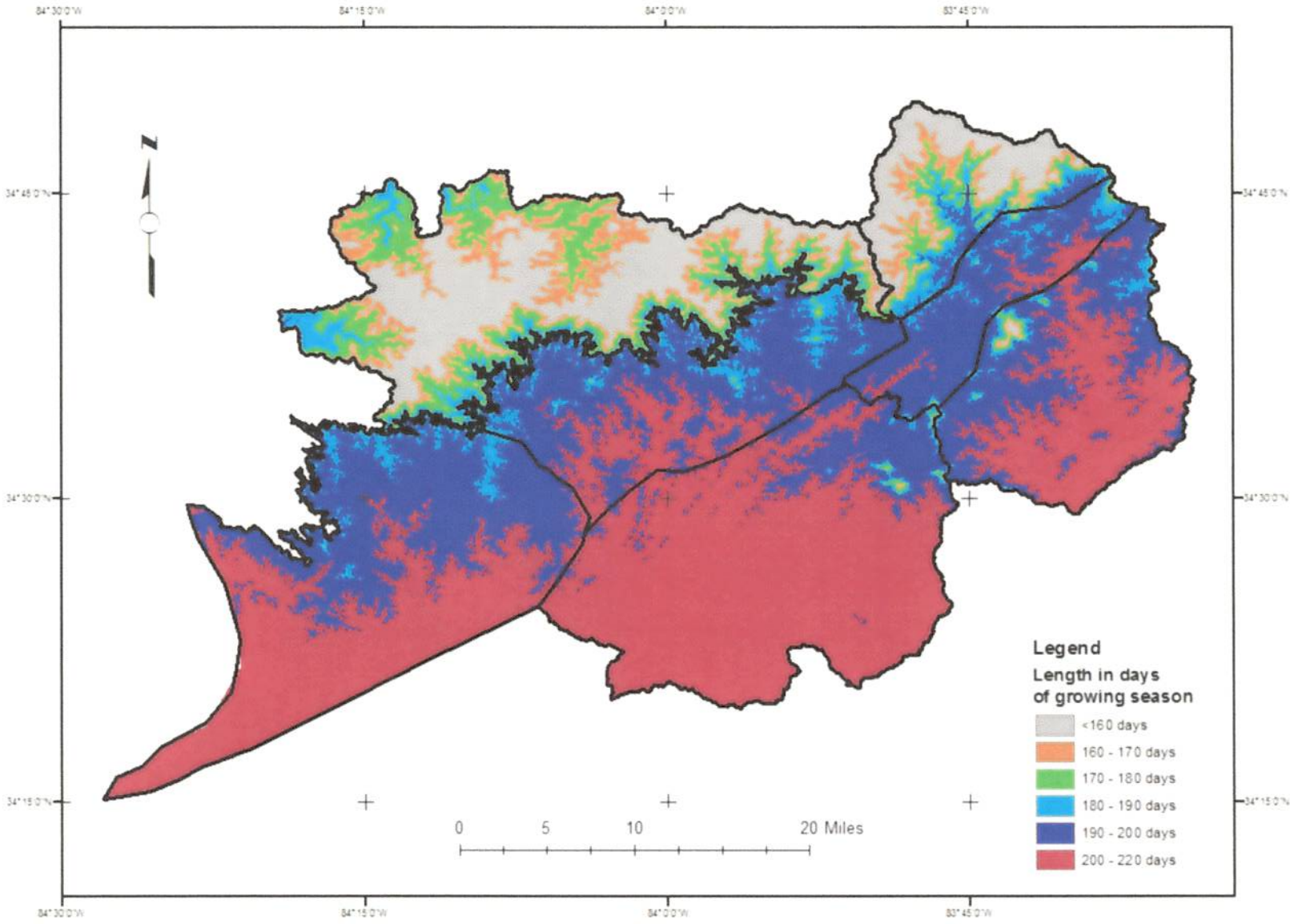

Figure 17 Estimated length in days of growing season (frost-free days) in the proposed Dahlonega Plateau AVA and surrounding comparison areas

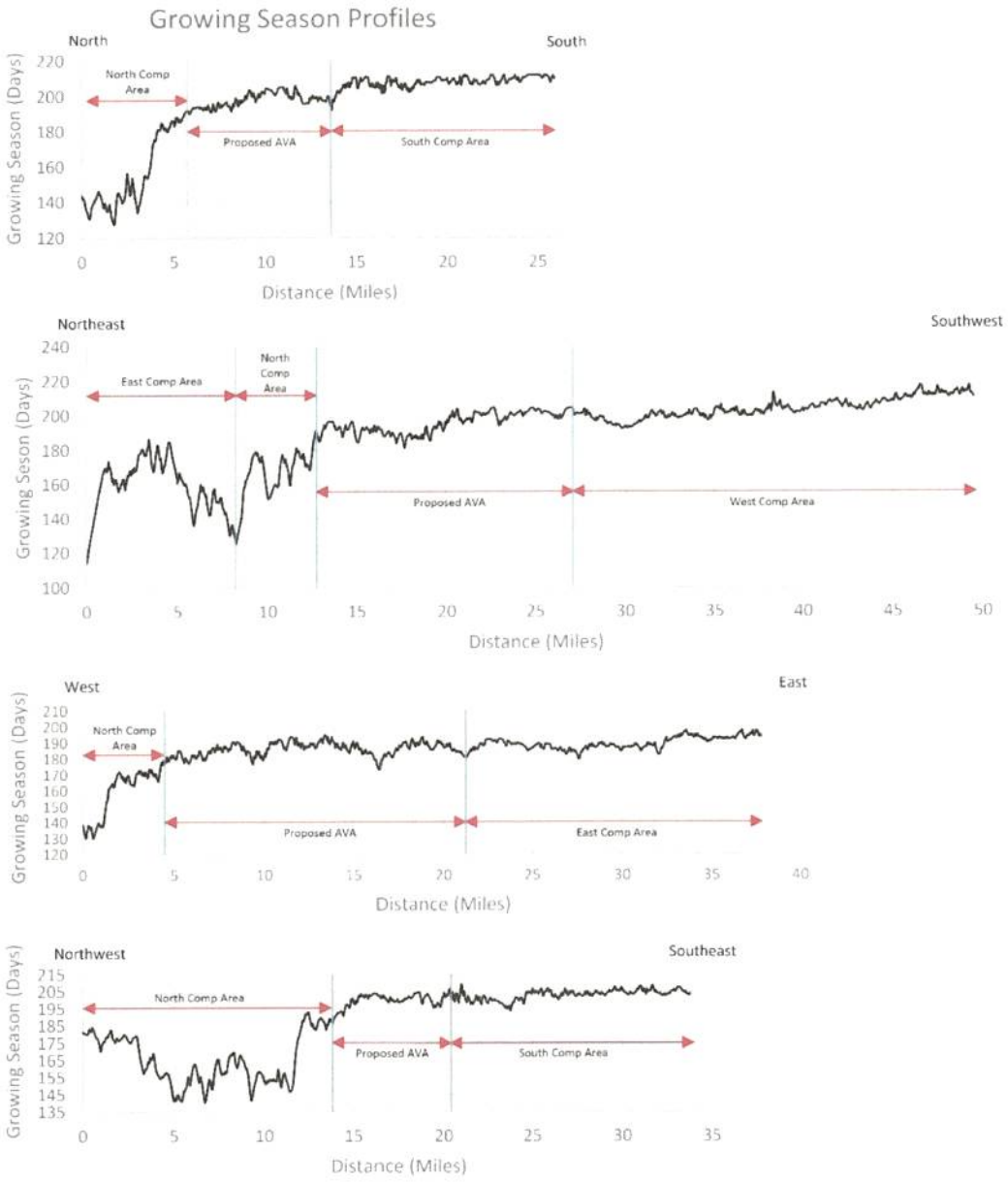

Figure 18. Profiles across the Dahlonega region showing the estimated length in days of the growing season between April 1 and October 31.

Though the length of growing season reflects the number of frost-free days in an area, it is important to have sufficient temperatures during the frost-free period to properly ripen grapes. A frost-free period of 180 days in which the mean temperatures does not exceed 50°F will not produce ripe grapes. In order to integrate length of growing season with mean temperatures we have analyzed the Dahlonega region using the concept of Growing Degree Days, also known as the Heat Summation method, developed by A. J. Winkler.[23] This method divides geographical areas into five categories, called Winkler Regions or Zones (Table 10) based on the number of degrees that exceed 50°F in a month's mean temperature, that being the generally agreed temperature at which grapes begin to grow. In the northern hemisphere this threshold temperature applies in the period from April 1 through October 31. Using the PRISM Climate Group's 1981-2010 gridded temperature normals we have calculated Winkler zones for 100-foot intervals for each of the comparison areas and the proposed AVA. The results of this analysis are shown in Figure 19 and Table 11.[24]

Number of Degree Days	Winkler Zones	Climate
2500 or less	I	Cooler ↕ Warmer
2501 – 3000	II	
3001 – 3500	III	
3501 – 4000	IV	
Greater than 4000	V	

Table 10. Winkler Zone boundaries

Terrains	Elevation Ranges (Feet) of Winkler Zones				
	V	IV	III	II	I
	Warmer ←				→ Cooler
Proposed AVA		1144 - 2060	2060 - 2346		
North Comp Area		1652 - 1900	1900 – 3500	3500 - 4460	
East Comp Area					
Blue Ridge Mtns.		*1441 - 1700*	*1700 - 3300*	*3300 – 4020*	*4020+*
Hightower Ridges		*1317 – 1820*	*1820 - 2386*		
Central Uplands		*1088 – 1930*	*1930 - 3165*		
South Comp Area					
Hightower Ridges	*1053 – 1100*	*1100 - 2060*	*2060 - 2181*		
Central Uplands	*1069 – 1275*	*1275 – 2015*	*2015 - 2584*		
West Comp Area	859 – 1300	1300 - 2033			

Table 11. Winkler Zone boundaries in the Dahlonega region comparison

[23] Amerine, M. A. and Winkler, CA. T., 1944, Composition and quality of musts and wines of California grapes. Hilgardia (University of California) 15:493-673.

[24] Growing Degree Day plots for the comparison areas are presented in Appendix 1.

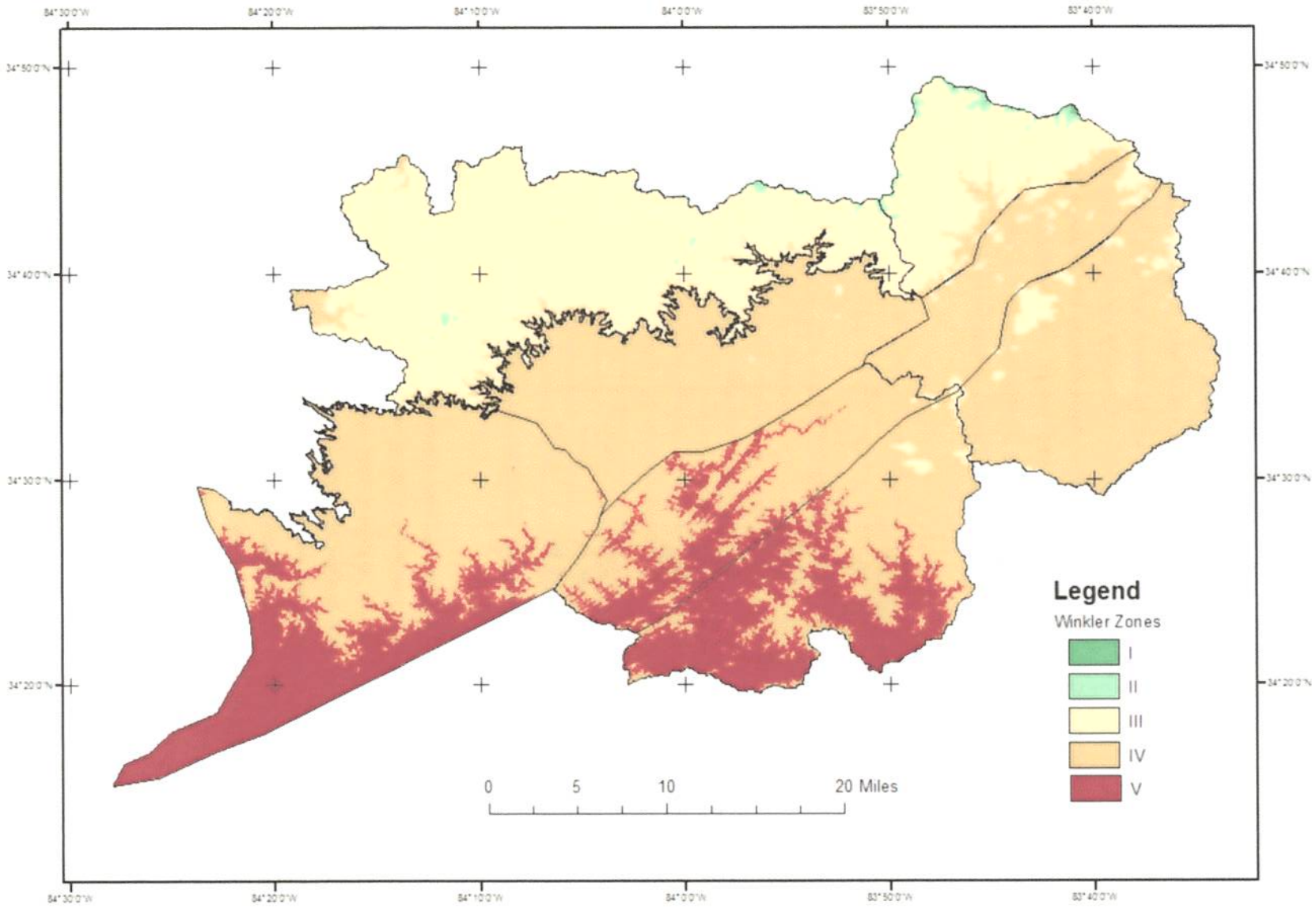

Figure 19 Distribution of Winkler zones within the Dahlonega region comparison areas

The results shown in Table 11 reveal some interesting aspects of elevation and growing season in the Dahlonega region. Though the proposed AVA and the Hightower Ridges have similar elevation ranges and mean elevations, the growing degree days analysis demonstrates that the boundary between Winkler zone III and IV is 245 feet lower in the Hightower Ridges of the east than the same boundary in the proposed AVA (1815' vs 2060'; See plots in Appendix 1). Similarly the boundary between zones III and IV in the north comparison area and the Blue Ridge Mountains of the east is also 200 feet lower in the east comparison area (1700' vs 1900'). The highest elevations of the Blue Ridge Mountain of the east area reach into Winkler zone I, which is the coolest of the zones in the classification, while the highest peaks of the north comparison area, which are several hundred feet higher than those of the east area, are still within Zone II, which is warmer than Zone I. The implication is that the higher elevation areas of the east comparison area (Blue Ridge Mountains and Hightower Ridges) are cooler than those of the north area and the proposed AVA.

Terrains	Winkler Zones Percentages				
	V	IV	III	II	I
	Warmer ◄				► Cooler
Proposed AVA		98.84	0.16		
North Comp Area		8.33	90.91	0.76	
East Comp Area					
Blue Ridge Mtns.		*10.03*	*83.94*	*5.83*	*0.20*
Hightower Ridges		*90.98*	*9.02*		
Central Uplands		*97.65*	*2.35*		
South Comp Area					
Hightower Ridges	*9.83*	*90.12*	*0.05*		
Central Uplands	*58.04*	*41.46*	*0.50*		
West Comp Area	31.61	68.39			

Table 12. Distribution of Winkler Zones in the Dahlonega region.

The growing season analysis leads to three conclusions: (1) The Blue Ridge terrains, north and east, are not suitable for extensive wine grape cultivation, as the growing season of the majority of the areas is not of sufficient length to ripen grapes properly. The lower parts of these terrains may be suitable for early-ripening *vinifera* varieties such as Riesling, Chardonnay and Pinot Noir, or cold-hardy French-American hybrids, which are the predominant varieties grown in the Upper Hiwassee Highlands AVA on the north side of the Blue Ridge from the proposed AVA; (2) the lower elevation terrains of the Dahlonega region are best suited to growing long season varieties of grapes, such as Muscadines, which are suitable for higher heat and humidity that characterizes these lower elevation areas; and (3) the proposed AVA and the Hightower Ridges of the east comparison area have the ideal growing season length for cultivation of late-ripening *vinifera* varieties such as Cabernet Sauvignon, Merlot and Sangiovese.

f) Precipitation

The presence of water, in the form of natural precipitation from rain- or snowfall, or from manmade irrigation, is an essential element for the survival of plant life. Water is the natural solvent that absorbs the plant's required nutrients from the soil and transports them through the roots into the vines and ultimately to the leaves and fruit. Without sufficient water the plant may suffer heat stress and die. Annual mean natural precipitation in the Dahlonega region varies widely ranging from a minimum of approximately 53" in the southwest parts of the west comparison area to over 80" in the Blue Ridge Mountains of the north and east comparison areas (Table 13).

Terrains	Mean Annual Precipitation (inches)		
	Minimum	Maximum	Mean
Proposed AVA	60.36	69.94	62.34
North Comp Area	59.48	80.73	68.10
East Comp Area			
Blue Ridge Mtns.	*65.31*	*79.74*	*70.00*
Hightower Ridges	*61.86*	*68.96*	*64.97*
Central Uplands	*57.03*	*68.25*	*60.78*
South Comp Area			
Hightower Ridges	*56.81*	*62.66*	*59.59*
Central Uplands	*53.87*	*62.85*	*67.14*
West Comp Area	52.91	65.08	58.77

Table 13. Mean annual precipitation in the Dahlonega region.

The southeastern flank of the Blue Ridge Mountains is ideally situated to receive moist southern winds from the Gulf of Mexico and moist southeastern winds from the Atlantic Ocean. As these warm humid winds move north and northwest the first high elevations they encounter are those of the southeastern flank of the Blue Ridge. The abruptly rising topography of these mountains acts as an orographic front that raises the humidity level of the winds, lowers their temperatures, and causes excessive localized precipitation to fall along their southeastern flanks. The mean annual precipitation along the Blue Ridge Mountains (north comparison area) and Dahlonega Plateau front ranges from 64-75" inches and 68-72 inches along the Blue Ridge/Hightower Ridge front of the east comparison area (Figure 20). The mean annual precipitation of the Hightower Ridges of the east comparison area is 64.97 inches, followed by the proposed AVA with 62.34 inches (Table 13). The other comparison areas, all of which are at lower elevations, have mean annual precipitations that range from 57.14-60.78 inches. The mean annual precipitation profiles in Figures 10, 11, 12 and 13 illustrate how precipitation varies with elevation across the Dahlonega region.

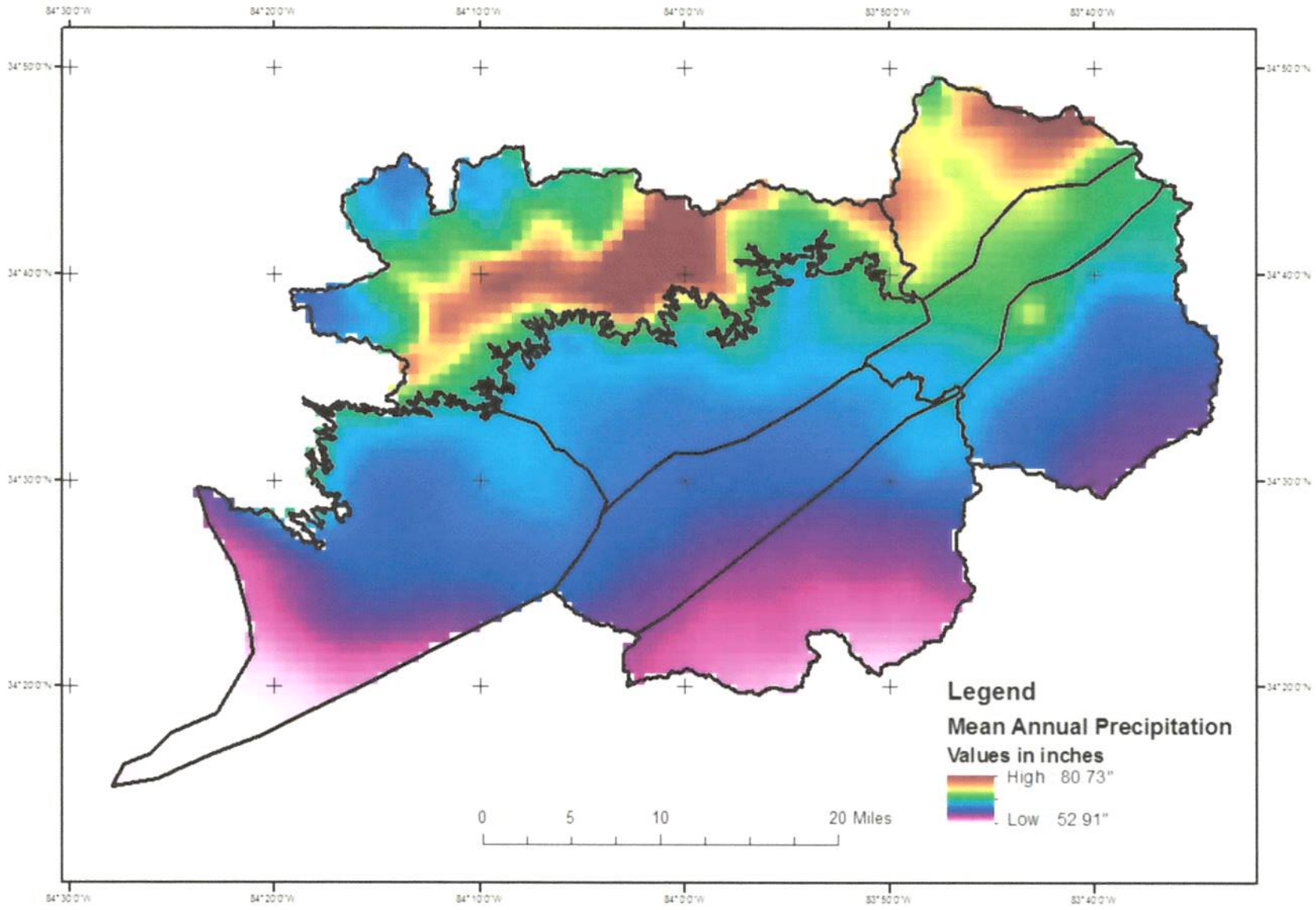

Figure 20 Mean annual precipitation in the Dahlonega region

Other important measures of precipitation for viticulture are the amounts that occur during the growing season and during winter months. In the north Georgia mountains the growing season typically occurs between April 1 and October 31, just as it is does for the greater part of the southeastern US. The recommended rainfall for mature grape vines is 24-30 inches per year during this seven-month period (Poling, 2006). The highest growing season precipitation occurs in the Blue Ridge Mountains of the north and east comparison areas and in the Hightower Ridges of the east area, while the lowest precipitation occurs in the south and west comparison areas and in the Central Uplands of the east area (Table 14). As with other climatic factors, mean annual

Terrains	Growing Season Precipitation (inches)		
	Minimum	Maximum	Mean
Proposed AVA	34.42	38.40	34.09
North Comp Area	32.19	44.52	37.59
East Comp Area			
Blue Ridge Mtns.	*36.41*	*46.53*	*39.81*
Hightower Ridges	*34.07*	*38.86*	*36.29*
Central Uplands	*31.52*	*38.45*	*33.74*
South Comp Area			
Hightower Ridges	*31.06*	*34.61*	*32.46*
Central Uplands	*29.39*	*34.73*	*31.30*
West Comp Area	28.93	35.87	32.20

Table 14. Growing season precipitation in the Dahlonega region.

precipitation in the proposed AVA is intermediate between the high and low elevation areas surrounding it. Excessive rainfall during the growing season can generate high humidity, a common condition in the southern Appalachians, which promotes excess vigor, fungal diseases and attracts insects, all negative factors for sustainable viticulture.

Excessive precipitation during the winter months of December, January and February can delay budbreak and/or pruning in vineyards, which can lead to late harvest and higher probability of early fall frost. The Blue Ridge Mountains of the north and east comparison areas run the highest risk of damage due to excessive winter precipitation, while the lowest risk is in the lower elevation terrains of the east, south and west areas (Table 15). The proposed AVA and the Hightower Ridges of the east area have intermediate values of winter precipitation.

g) Geology and Geomorphology

The Dahlonega region has an extremely complex geological history, including multiple episodes of deformation and metamorphism that have resulted in the juxtaposition of four major geological 'terranes'[25] that partially form the comparison areas of this petition. Figure 21 shows the relationship of the geological terranes to the comparison areas.

[25] Geological terranes refer to fragments of paleogeographic units that have been broken off crustal plates and sutured to other plates by faulting. The term 'terrain' that we have used throughout the petition refers to present day topographic areas that make up the comparison areas surrounding the proposed AVA.

Terrains	Winter (Dec-Jan-Feb) Precipitation (inches)		
	Minimum	Maximum	Mean
Proposed AVA	16.39	19.65	17.40
North Comp Area	15.63	22.43	18.80
East Comp Area			
Blue Ridge	*16.92*	*20.04*	*18.53*
Hightower Ridges	*17.10*	*18.30*	*17.52*
Central Uplands	*15.50*	*18.23*	*16.54*
South Comp Area			
Hightower Ridges	*15.70*	*17.35*	*16.65*
Central Uplands	*14.91*	*17.35*	*15.86*
West Comp Area	14.49	18.00	16.27

Table 15. Winter precipitation in the Dahlonega region.

The Western Blue Ridge terrane is the dominant geological unit of the western comparison area; the Cowrock terrane dominates the Blue Ridge Mountains of the northern and eastern comparison areas and forms the northern part of the proposed AVA; the Dahlonega Gold belt forms the southern part of the proposed AVA and the northwestern portions of the Hightower Ridges in the south and east comparison areas; and the Tugaloo terrane forms the southeastern portions of the Hightower Ridges and the entire Central Uplands areas of the south and east comparison areas. Generalized stratigraphic units that comprise the four terranes are described in Table 16. Though the geological units of these four terranes are the main source of Dahlonega region soils, it is not clear how the mineralogy and chemistry of the terranes' lithologies have contributed to the various soil types. What is clear is the relationship of the geological units to the area's geomorphology, which differs widely among the comparison areas and plays a significant role in each area's suitability for viticulture.

Geological Terrane	Dominant Formation	Main Lithologies	References
Cowrock Terrane	Coleman River Fm.	Metasandstone and schist, with some mafic and ultramafic bodies	Hatcher et al, 2005
Dahlonega Gold Belt	Otto Fm., Lake Burton Mafic-Ultramafic Complex	Metasandstone, muscovite schist, calcareous and muscovite quartzite, aluminous schist, gneisses, amphibolites, manganifersous magnetite quartzites with a number of meta-igneous intrusive and extrusive bodies	German, 2013 Thigpen & Hatcher, 2009
Tugaloo Terrane	Ashe-Tallulah Falls Fm.	Metasandstone, pelitic schist, aluminous mica schist, with varying amounts of amphibolite and basement rocks	Hatcher et al, 2005
Western Blue Ridge	Great Smoky Group	Massive-bedded, unsorted and graded sandstone and argillites of the Rich Butt sandstone and a lower dark, pyritic and carbonaceous argillite.	Thigpen & Hatcher, 2009

Table 16. Main formations and lithologies in geological terranes of the Dahlonega region.

The Cowrock terrane is a thrust sheet that has been tectonically transported by faulting from the east or southeast over the Western Blue Ridge terrane; it forms the highest elevations of the Blue

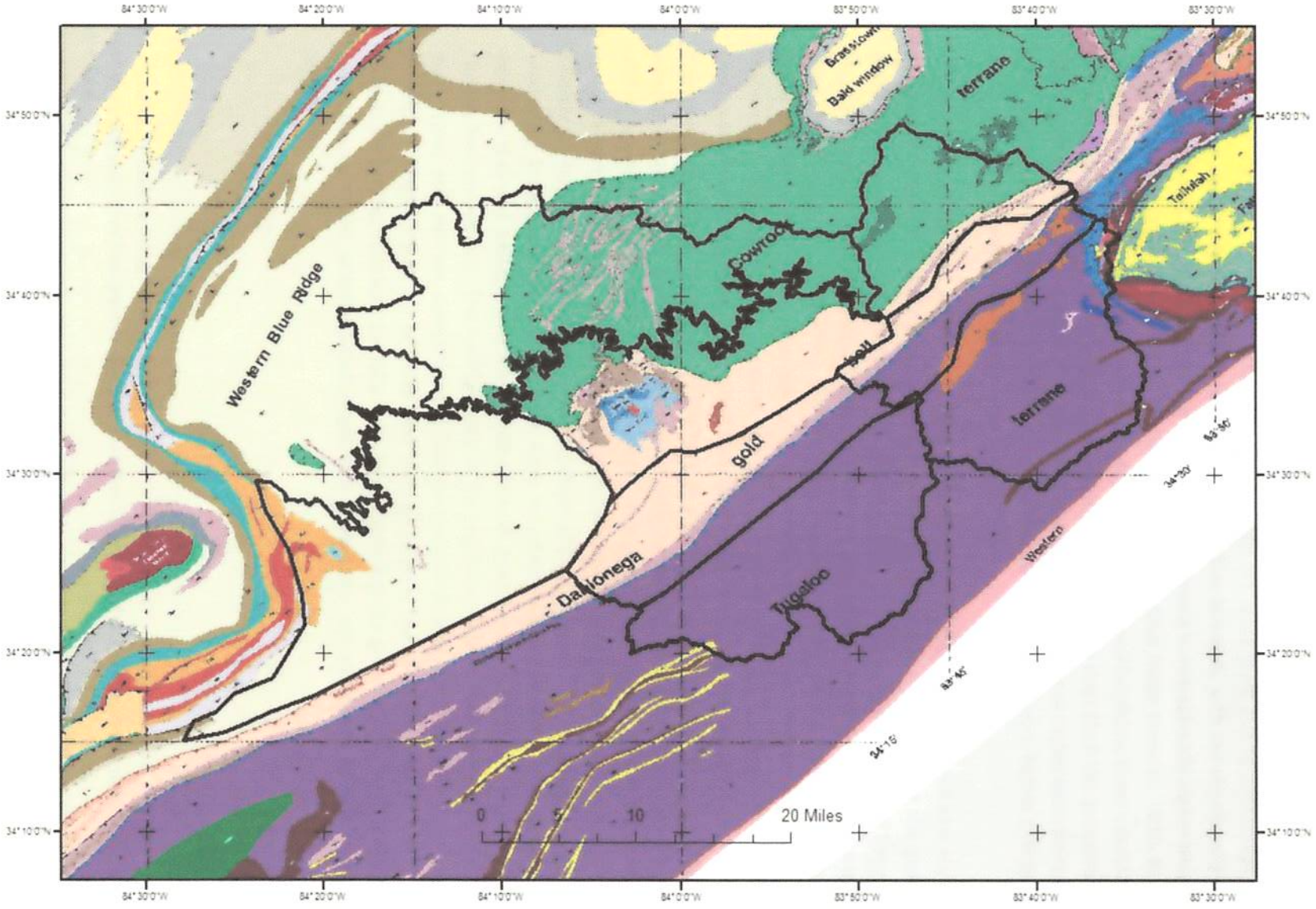

Figure 21 Tectonic map of the Dahlonega region showing relationship of geological terranes to comparison areas. From Thigpen and Hatcher (2009) Used by permission of Prof. Robert Hatcher, University of Tennessee, Department of Geology

Ridge Mountains of the north and east comparison areas, while the Western Blue Ridge terrane forms the lower elevation mountain peaks at the southwest end of the Blue Ridge that borders the Dahlonega region. These geomorphic distinctions are most likely due to differences in the weathering and erosion characteristics of rocks in the two terranes, with the structurally higher and more erosion-resistant Cowrock terrane lithologies forming topographically higher areas than the structurally lower, less resistant rocks of the Western Blue Ridge terrane. With its lower elevations, the west comparison area has higher temperatures and humidity, lower precipitation, a longer growing season and a higher number of growing degree days than the proposed AVA. The Blue Ridge Mountains of the north and east comparison areas have higher elevations due to their more erosion-resistant rock units and thus have lower temperatures, higher precipitation and a shorter growing season than the proposed AVA.

The Dahlonega Gold Belt, which is the main terrane of the Hightower Ridges of the east and south comparison areas, is a shear zone produced by intense tectonic movement along the geological faults that bound it on the northwest and the southeast. The pervasive shearing of the narrow Gold Belt zone in the Hightower Ridges has produced geomorphic features that differ markedly from those of the proposed AVA. The dominant drainage pattern of the Hightower Ridges is a trellis pattern, which is characteristic of areas in which streams align themselves to structural features or lithological differences in the rocks. According to Dr. Jerry German (personal communication, 2015), who has mapped and interpreted the geology of the Dahlonega Gold Belt extensively, the trellis pattern so clearly seen in the Hightower Ridges is a result of differential weathering of strongly developed northeast-oriented mylonite zones[26] in the Gold Belt lithologies and of prominent northwest-oriented joints.[27] The secondary drainage parallels the mylonite zones, the tertiary drainage parallels the joint pattern, while there is no discernible control on the primary drainage. By contrast the drainage pattern of the proposed AVA consists of broad valleys separating broad, rounded hilltops that have no directional orientation. This is a so-called dendritic drainage pattern, which is characteristic of stream flow on an erodible and uniformly-dipping bedrock surface. The trellis pattern of the Hightower Ridges produces a 'washboard' like topography with narrow, closely-spaced hilltops and valleys that run in parallel trends for long distances. These ridges are so close that they produce a 'mountain shadowing' effect in the valleys, preventing optimum sunlight from entering during the growing season. In addition the steep slopes of the closely-spaced ridges and valleys are not conducive to safe mechanical cultivation.

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[26] Mylonite zones are zones of fine-grained, compact rock that have formed as a result of recrystallization in ductile fault zones.

[27] Joints are brittle fracture surfaces in rocks along which there has been no discernible displacement parallel to the surface. They normally occur widely in sets or systems throughout areas of rock outcrop, and are commonly surfaces of weathering weakness.

h) Summary of Distinguishing Characteristics

The proposed Dahlonega Plateau AVA is located at the northeast end of the greater Dahlonega Plateau, a northeast-southwest-trending physiographic feature that represents the last and highest terrain of the north Georgia Piedmont; it occupies a unique environmental setting that clearly distinguishes it from surrounding terrains, including the southwest extension of the Plateau. To summarize the AVA's distinguishing viticultural features we have divided the surrounding terrains into four comparison areas that lie to its north, east, south and west. To the north the AVA is bounded by the steep, rugged peaks of the Blue Ridge Mountains, with the boundary between these features drawn along the 1800-foot topographic contour, this elevation representing an approximate change in slope between the steep Blue Ridge front and the gentler sloping Plateau area. To the east the bounding area comprises three quite different terrains: the eastern extension of the Blue Ridge Mountains, followed to the south by the Hightower Ridges, succeeded southward by the Central Uplands province. On the south the AVA is bounded by the long, linear ridges and valleys of the Hightower Ridges, which are succeeded southward by the extension of the Central Uplands province. On the west lies the southwestern portion of the greater Dahlonega Plateau. The boundary between the AVA and the extension of the Plateau is drawn approximately along a major geological boundary that separates two distinctly different geological terranes, an important factor in explaining the differences in elevations between the two areas.

With elevations that range from 1141 feet to 2346 feet, and a mean elevation of 1554 feet, the Dahlonega Plateau AVA has an ideal mean annual temperature, length of growing season and number of growing degree days to cultivate the most important and popular of the *Vitis vinifera* wine grapes, such as cabernet franc, cabernet sauvignon, chardonnay, merlot, and others. The geographic position along the steep slope of the Blue Ridge allows cool, dense night air that forms at higher elevations to flow down and across the AVA and moderate the warm daytime temperatures. This phenomenon is considered ideal for wine grape cultivation as it slows the ripening process to preserve good flavor compounds generated in the berries during the day. Irrigation systems are rarely utilized in the proposed AVA, as mean annual precipitation during the growing season provides the nearly ideal amount of recommended rainfall to the vineyards.

To the north and east of the AVA the Blue Ridge Mountains range in elevation from 1441 feet to 4460 feet, with a mean elevation of around 2450 feet. At these elevations the mean annual temperatures are cooler than those of the proposed AVA, and the growing season for most of the area is shorter than 160 days, which is too short for complete ripening of wine grapes. The high elevations pose a high risk of late spring and early fall frost, as well as vine damage due to harsh winter weather. At lower elevations of the Blue Ridge Mountains it might be possible to grow some cooler-climate *vinifera* varieties, such as Riesling, Chardonnay and Pinot Noir, as well as French-American hybrids grapes, which are cold-hardier than the *vinifera* varieties grown in the proposed AVA, and are the dominant grapes grown on the north side of the Blue Ridge in the Upper Hiwassee Highlands AVA. Not only is length of growing season a problem in the Blue Ridge

terrains, but the high annual precipitation produces high humidity, promotes fungal diseases and attracts insects.

The Hightower Ridges of the south and east comparison areas have similar elevation, mean annual temperatures and length of growing season as the proposed AVA and would be suitable for *vinifera* cultivation as in the AVA, but the peculiar geomorphic features of the area present a major obstacle to good viticulture over much of the areas. The 'washboard' topography of narrow, closely-spaced ridgetops and valleys cause 'mountain shadowing,' which prevents good sunlight penetration, and the steep slopes of the narrow ridges are not conducive to mechanical cultivation, which is a negative economic factor. To our knowledge there is only one vineyard presently located in the Hightower Ridges terrain of the east comparison area.

The Central Uplands areas of the east comparison area ranges in elevation from 1088 feet up to 3165 feet, with a mean elevation of 1447 feet, over 100 feet lower than the proposed AVA. Due to its great range of elevation the area has a greater range in length of growing season than the proposed AVA (139-2011 days vs 167-209 days). Though the greater part of the area falls within Winkler Zone IV, there is a small area that is within Zone III, which would be suitable for cultivating French-American hybrid grapes and cool-climate varieties of *vinifera*. With a mean maximum July temperature of 86.7°F the area runs a high risk of excessive growing season temperatures that may delay complete ripening of grapes in large parts of the area. The lower elevations may be most suitable for warm-climate *vinifera* varieties and for muscadine and table grapes. There are three vineyards locate in this comparison area.

The Central Uplands of the south comparison area lie at elevations ranging from 1070 feet to 2584 feet, with a mean elevation of 1257 feet, almost 200 feet lower than the Central Uplands extension in the east area and the proposed AVA. The mean annual temperature is warmer than both the Central Uplands extension in the east area and that of the proposed AVA, with the lower elevations of the area well into Winkler Zone V, the warmest areas of the Winkler classification. Like its extension in the east comparison area, the Central Uplands of the south area has a high mean July daytime temperature (87.3°F) and runs a high risk of excessive growing season temperature for the cooler temperature *vinifera* grapes. Its best suitability would be for the warmer-climate *vinifera*, and for muscadines and table grapes.

The west comparison area, which is the southwest extension of the Dahlonega Plateau, has an elevation range of 859 feet to 2033 feet and a mean elevation of 1386 feet. The growing season of the area ranges from 178 to 219 days, with an average of 201 days. Similar to the Central Uplands of the south area, the west comparison area falls within Winkler Zones IV and V, with suitability of growing warmer-climate vinifera varieties, muscadines and table grapes.

6) Conclusion

With a unique name that reflects the history and natural environment of the region, a well-defined area with environmental characteristics that distinguish it from surrounding terrains, and seven

vibrant and active vineyards cultivating 110 acres and producing wines of outstanding quality the northeastern portion of the Dahlonega Plateau meets fully the requirements of an American Viticultural Area. It is therefore with great pleasure that we submit this petition for establishment of the Dahlonega Plateau AVA.

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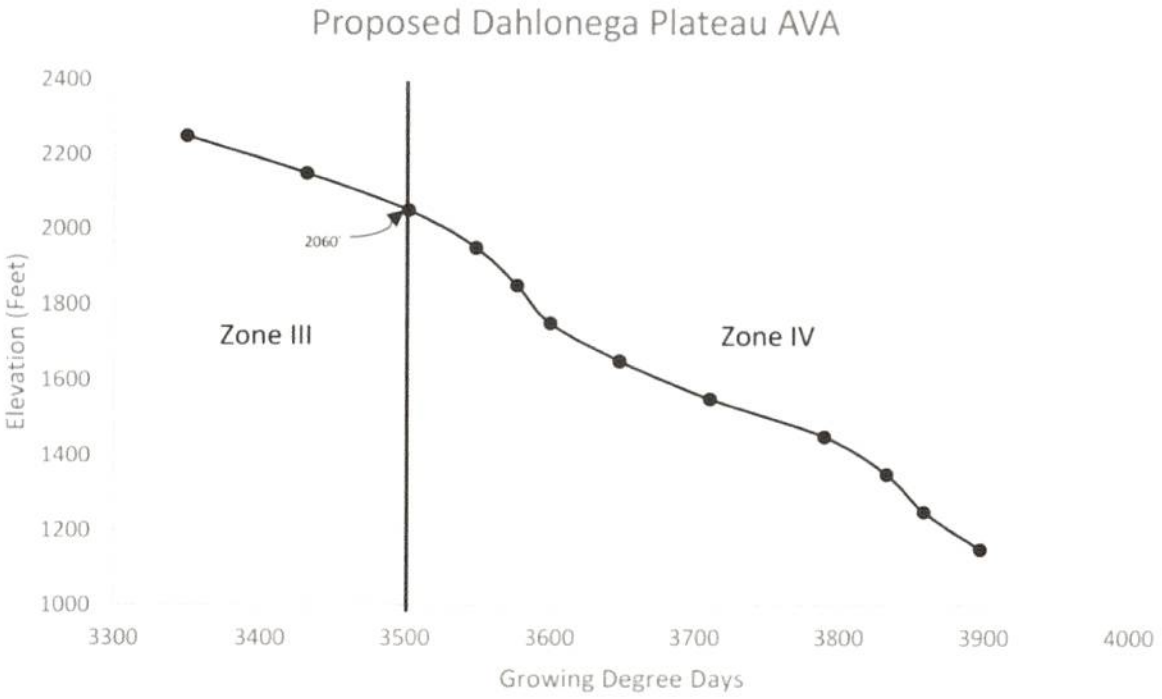
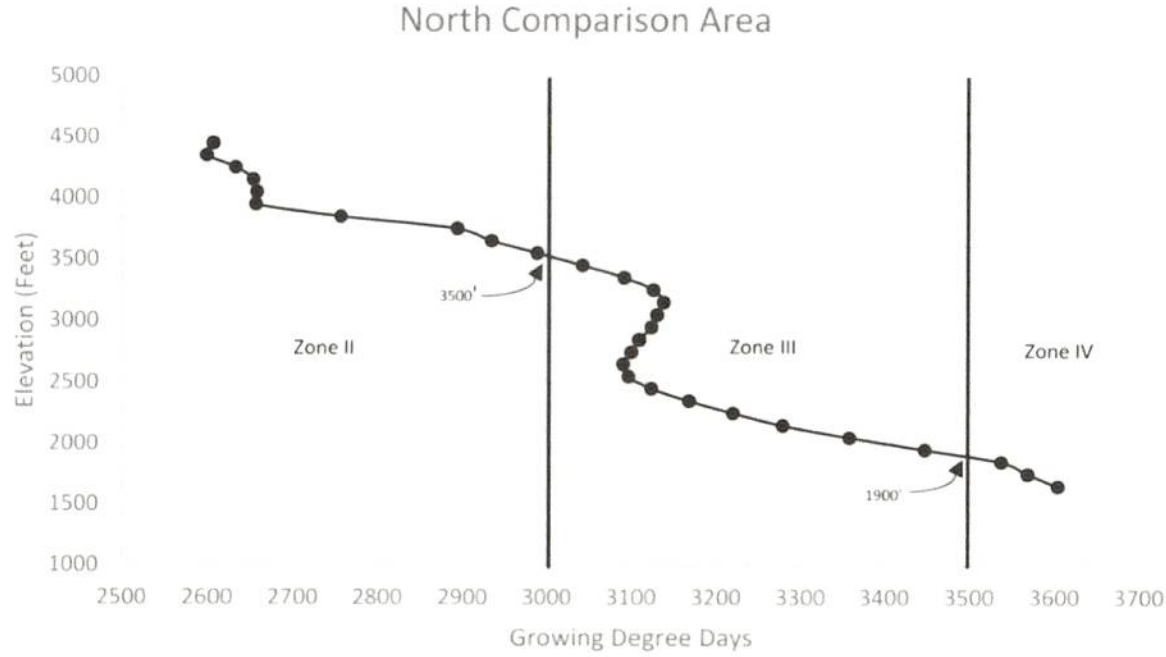
Appendix 1 – Winkler Zone Plots





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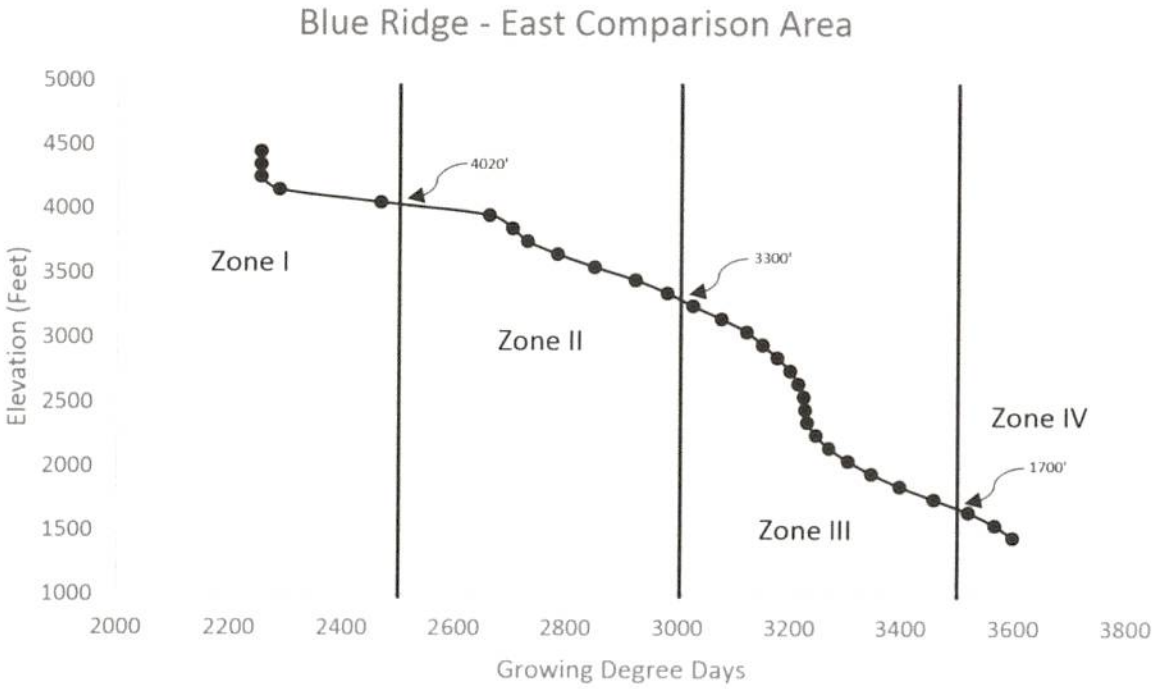

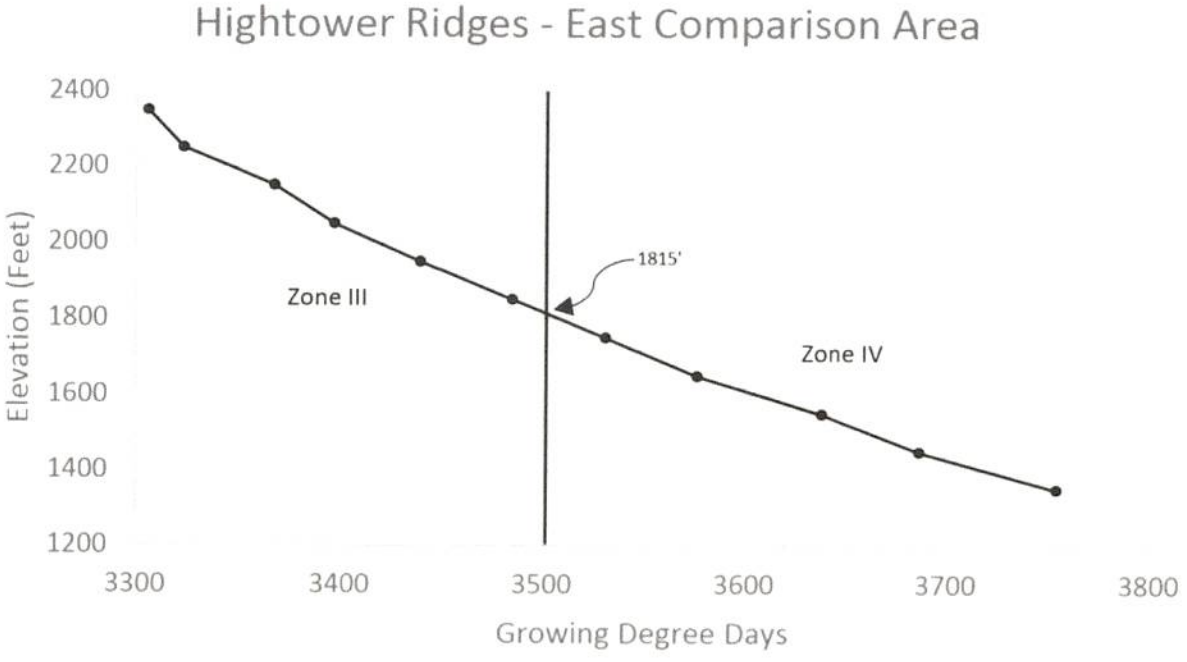

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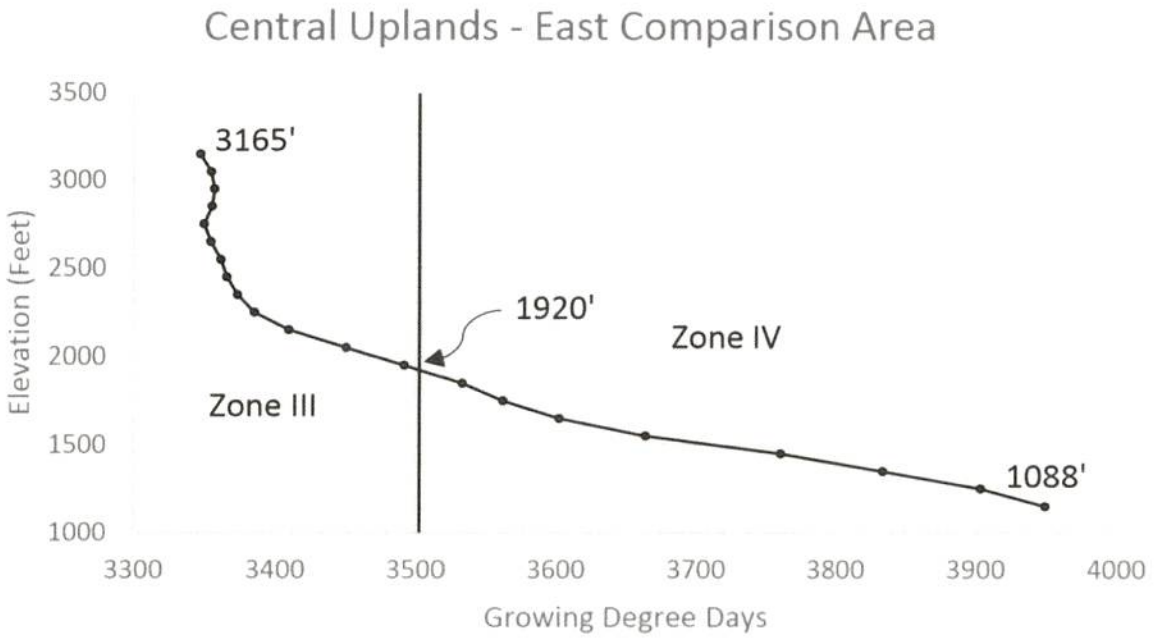

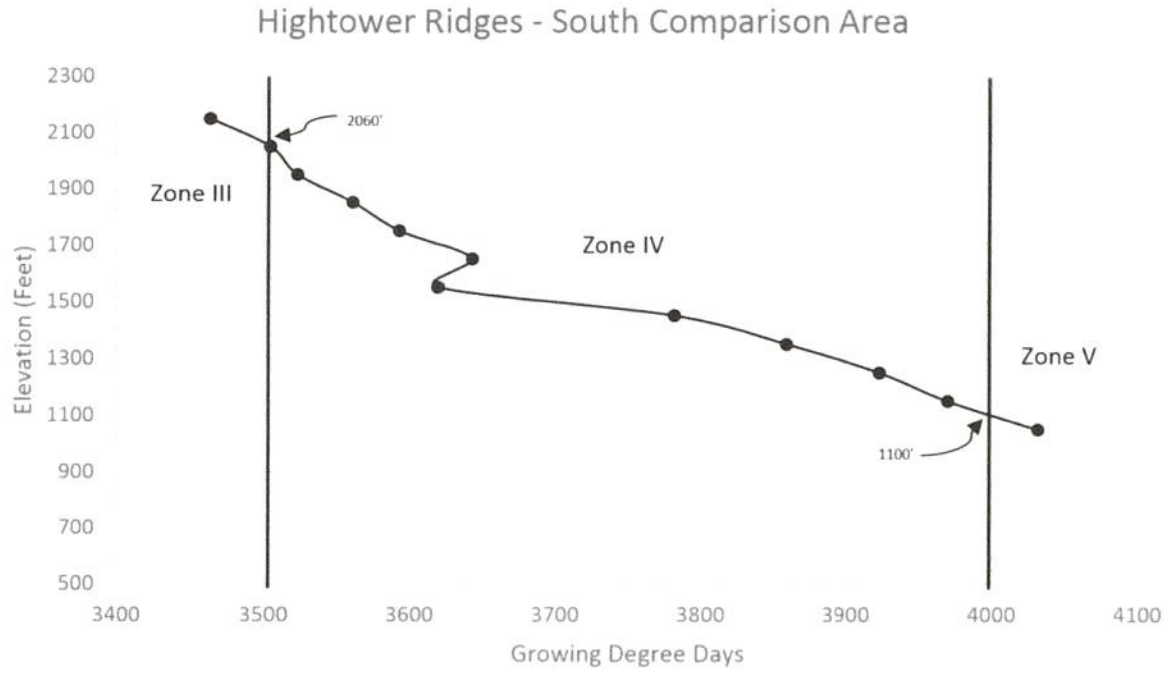

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