

MONTICELLO
VITICULTURAL AREA

MONTDOMAINE CELLARS, INC.

ROUTE 6, BOX 168 A • CHARLOTTESVILLE, VIRGINIA 22901 • PHONE (804) 977-6120
(Located at Carters Bridge, Route 20 South)

May 1, 1981

Director,
Bureau of Alcohol, Tobacco, and Firearms
Washington, D. C. 20226

Subject : American Viticultural Areas; application for the establishment of the "Monticello Viticultural Area."

Reference : 27 CFR Section 4.25a(e)(2)

Sir,

In accordance with the above reference, the undersigned hereby petition the Government for the establishment of the "Monticello Viticultural Area."

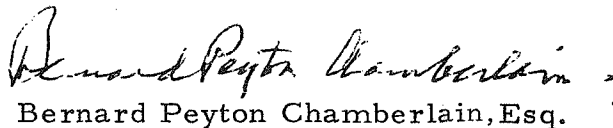
I. through V. refer to the elements required by 4.25a(e)(2), such as evidence, description, boundary narrative, maps, etc.

There are three operational bonded wineries plus one applicant with permit pending currently in the proposed viticultural area. There are numerous vineyards with an estimated 114 acres planted or proposed as of this writing.

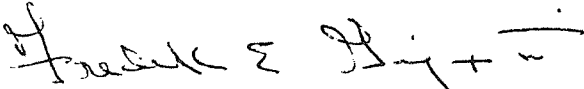
Respectfully submitted,



Michael E. Bowles,
Montdomaine Cellars, Inc. BW Va 32



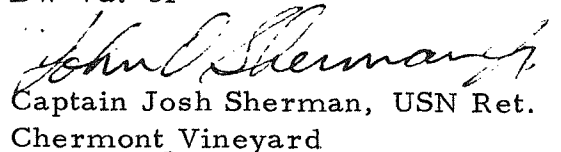
Bernard Peyton Chamberlain, Esq.



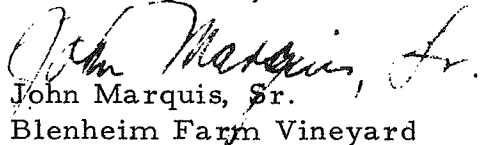
Fredrick E. Gignoux III
Charlottesville Vineyards



Gabrielle Pausse,
Barboursville Winery Inc.
BW Va. 31



Captain Josh Sherman, USN Ret.
Chermont Vineyard



John Marquis, Sr.
Blenheim Farm Vineyard

I. The name is known...

In the year 1767 Thomas Jefferson began clearing and leveling the top of a magnificent mountain on his family estate to which he gave the name "Monticello," Italian for "little mountain." He always preferred and used the Italian pronunciation.

Monticello itself physically and psychologically dominates the area, and, as any schoolchild familiar with the back side of a nickel knows, was the site of his home, depicted thereon. Monticello was also the site of our first great connoisseur's early viticultural efforts.

The Wine Company¹ was formed at Williamsburg in 1774 with 37 investors paying 50 pounds sterling per share. Leading the list of subscribers were His Excellency Earl Dunmore, Royal Governor of Virginia, George Washington, Thomas Jefferson, George Mason, Peyton Randolph, Benjamin Harrison, et al. The main purpose of this undertaking was the establishment of European style viticulture in Virginia. Soon Dr. Filippo Mazzei (recently honored on the new 40¢ U.S. airmail stamp) of Tuscany arrived with a dozen vigneron and 10,000 vine cuttings from Leghorn. He eventually settled hard against Monticello Mountain on land provided by Mr. Jefferson. He named his site "Colle."

The Italian Mazzei, who came here to make wine fixed on these South West mountains, having a S.E. aspect, and abundance of lean & meagre spots of stony & red soil, without sand, resembling extremely the Cote of Burgundy from Chambertin to Montrachet where the famous wines of Burgundy are made. I am inclined to believe he was right in preferring the South Eastern face of this ridge of mountains. It is the first ridge, from the sea, begins on the north side of the James River, & extends north eastward, thro' the state...²

Mazzei's viticultural activity was brisk and promising until being cut short by a collision with a momentous event: the American Revolution. The problems were complex: after two years of toil, the term of employment for most of the vigneronns had either expired, or they had entered the Continental Army. Eventually, even Mazzei himself became unavailable, being sent to Europe as agent for the State of Virginia. During his absence, his home Colle was leased to a Hessian general, Baron von Riedsel, who had been captured at Trenton and was incarcerated locally, under eighteenth century rules, on his own parole. Unhappily, the general's horses, according to a recollection of the elderly Jefferson, trampled down the vines. This terminated the experiment which would have, hopefully, proven the practicability of quality viticulture in Virginia.

After the Revolution, grape cultivation persisted nearby. Jefferson himself made extensive plantings on Monticello Mountain.

Colonel Monroe, our Secretary of State, whose seat (Ash Lawn) is within 2 or 3 miles of me (Monticello), has a fine collection of vines which he had selected and brought with him from France with a view to the making of wine...³

Jefferson had a very high opinion of Mazzei's judgment. He actually gave him his original draft of the Declaration of Independence. Further, Mazzei's professional wisdom and insight regarding viticultural site selection were to be vindicated.

In 1835, Dr. D.N. Norton of Richmond propagated a domestic, non-foxy native blue grape that eventually bore his name. The Norton grape was the foundation of Virginia Claret. The Monticello Wine Company in Charlottesville, in the very shadow of Monticello Mountain and Mazzei's chosen sites, became nationally and internationally

famous. Their wines won a gold medal in Vienna in 1873 and a silver medal in Paris in 1878.⁴ Other medals were awarded at the Paris Universal Expositions of 1889 and 1900. The grapes for the superb Norton-based Virginia Claret came from vineyards in the currently proposed Monticello Viticultural Area. Charlottesville became known as the "Capital of the Virginia Wine Belt"⁵ and the Rivanna River as the "Rhine of America."

The 1900 census reported a total of 240,864 grapevines, but this number decreased drastically during the next twenty years. By 1930 grape production had become practically negligible, 5,016 vines being reported in that year.⁶

Of course, the reasons for the decline were Virginia's statewide prohibition of 1914, Wartime Prohibition of 1919, and the Volstead Act of 1920. The respective governments had effectively quashed viticulture and fine winemaking.

Repeal was declared on December 5, 1933. Soon after, in 1934, Mr. Benard Peyton Chamberlain, today still an active attorney and connoisseur attempted to revive cultivation of the vine via the Monticello Grape Growers Co-operative Association.⁷ The veteran sites preferred by Mazzei, Jefferson, and the old Monticello Wine Company were to be replanted. However, the exigencies of the mid-depression and the agricultural priorities posed by the imminence of World War II proved insuperable. The project was stillborn.⁸

In 1976, the year of the American Bicentennial, the venerable Barboursville Plantation, seat of Jefferson's friend, former Governor and U.S. Senator James Barbour, was acquired by Cantine Zonin, S.p.A.,

of Gambellara (Vicenza), Italy. Their announced intention was the renewed pursuit of high quality wine production in Virginia. Barboursville's first commercial vintage is currently making its appearance. An historic dream re-materializes.

II. Boundaries are as specified...

The area outlined in this application has as its central recognizable geographical feature, Monticello Mountain, which also provides the name identity.⁹ Monticello Mountain is the distinguishing promontory in the Southwest Mountain ridge and is the core of the Davidson soil band.¹⁰

Four major rivers enclose the viticultural area: the historic James, the Rockfish, Mechums River, and the South Fork of the Rivanna River. The entirety of vineyard locations which supplied the old Monticello Wine Company were within the proposed viticultural area. Movement in any cardinal direction away from the defined area will reveal sharp contrasts in topography, soil type and climate character. These circumstances clearly account for the insistent preference of this delimited area by the historic viticulturists.

The adjacent terrain to the East is characterized by the gradual sloping away of the Piedmont Plateau with its attendant weather phenomena and soils related to the Carolina Slate Belt. This soon becomes the easily distinguishable Coastal Plain. To the West occurs the singularity of the Blue Ridge Mountain chain, a dramatic natural barrier. Completing the limiting boundaries are the James River system to the South and the Rivanna River system to the North. These have been the traditional boundaries at least since the time of Jefferson and Mazzei.

This country (Monticello) is better calculated than any other I am acquainted with for the produce of wine; but I cannot say the same in regard to oil and lemons...

Letter, Mazzei to George Washington¹¹

III. Geographical features...

A. Soil

The core of the Monticello Viticultural Area is the belt, running from the southwest to the northwest and centered on the Southwestern Mountain chain, including Monticello Mountain itself, and known as the Davidson Starr Soil Association (see attached soil map).¹²

Davidson Clay Loam. This soil, locally known as "red land" or "push land," in forested areas has a thin layer of leafmold on the surface. The topmost 2 or 3 inches of the surface layer is darkened by an admixture of organic matter from this decomposed leaf litter, and is a dark brown to reddish-brown heavy silt loam, passing rather abruptly into a heavy clay loam, which extends to a depth of 7 to 8 inches. In cultivated fields the upper layers are thoroughly mixed to form a reddish-brown to red heavy clay loam. This is underlain by a deep-red or maroon clay subsoil ranging from 30 to 40 inches in thickness. The subsoil is a heavy smooth clay that breaks into small irregular lumps when air dired but is somewhat plastic when wet. In places it contains numerous soft black concretions of manganese oxide. The subsoil gradually becomes lighter in texture and color as it passes into the mottled reddish-brown, ocher-yellow and white friable soil material from which it is developed. Beneath this parent material, at a depth ranging from 5 to 10 feet, the dark-colored basic rock is reached. In places some dark-colored heavy rock occurs in the subsoil and near the surface.

In most places Davidson Clay Loam is uniform, although some variations occur in the content of rock, depth of weathering, and texture of the surface soil. As mapped, this soil includes a few small areas of Davidson Loam and Montalto Loam that were too small to separate on the scale used.

The total area of Davidson Clay Loam in Albemarle County is 37.9 square miles. The largest bodies occur on each side of Green Mountain, Carter's Mountain, Monticello Mountain, and through the Southwestern Mountains, ridges that traverse the county in a northeast to southwest direction beginning near Esmont, through Carter's Bridge on

the Hardware River where the underlying rock is greenstone or altered diorite or other basic rock.

The land is undulating to rolling and is cut by numerous small streams. Drainage is good, and the subsoil is very retentive of soil moisture. This soil has suffered considerable sheet erosion, but in places the soil mantle is so thick that it will stand considerable surface wash without serious injury.

Practically all of this soil has been cleared of its original forest cover of various oaks, poplar, locust, maple, hickory, some cedar and pine and most of it (about 90%) is at present being used for agricultural purposes.

Davidson Clay Loam is generally recognized as being one of the most productive soils in the Piedmont Plateau. It is well suited to the production of corn, small grains, alfalfa, and clover, and in this section it particularly produces an excellent bluegrass sod and is in great demand for the production of grapes. This soil, as well as its hilly phase, is much desired for apple growing and for grape culture, especially since grape growing has been recently rejuvenated. Some of the oldest and best vineyards were on this soil, and the wines produced were particularly good for blending with other wines.¹³

B. Climate.

The growing season, defined as the period between the average date of the last freezing temperature in Spring (April 9)¹⁴ and the average date of the first freezing temperature in Fall (November 6), is 211 days. Though the growing season is too short for crops such as cotton and sugarcane, the rainfall and temperature are favorable for the production of a large variety of other crops, such as winter wheat, rye, oats, clover, and similar crops. Such fruits as apples, peaches, pears, and grapes do well under the prevailing climate.

The mean annual precipitation is 44.61 inches, which is very evenly distributed throughout the year. The three month period June, July and August have a mean rainfall of 14.74 inches, and represents the wettest season. September, October, and November have a mean rainfall of 9.31 inches. Violent storms are comparatively rare, and destructive droughts¹⁵ are uncommon. The average snowfall is 19.4 inches.

See the attachment, courtesy of the Virginia State Climatologist, for charting of the heating and cooling degree days.¹⁶ Even a

brief study of these pictorially presented data shows the uniqueness of the Monticello Viticultural Area compared to the surrounding areas.

IV. Narrative description of area boundaries...

Beginning at North Garden, Virginia, on a direct line northward to the point of intersection of Mechums River and the C&O Railway, thence along Mechums River to its confluence with the South Fork of the Rivanna River, along this river and the Rivanna Reservoir to junction with the Southern Railway, thence along the railway northeast bound to the corporate limits of the town of Orange, thence southwest bound along U.S. Route 15 to its intersection with the Albemarle County boundary, thence southwest bound along the Albemarle County line until intersecting the James River, thence along the James to its confluence with the Rockfish River, thence along the Rockfish to its point of divergence with the Albemarle County boundary, thence along the county line to the point of intersection with the Southern Railway, thence along the railway to the original starting point, North Garden, Virginia.

V. USGS Map attached of the largest appropriate scale with the boundary prominently marked.

FOOTNOTES

- ¹ Jefferson and Wine, The Vinifera Wine Growers Association. The Plains, Virginia, p. 133.
- ² Thomas Jefferson, letter, Monticello 10/1/1811, Library of Congress.
- ³ Thomas Jefferson, letter, Monticello 1/13/1816, Library of Congress.
- ⁴ Leon D. Adams, The Wines Of America, second ed., 1978, p.67.
- ⁵ Adams, p. 67.
- ⁶ USDA Soil Survey, Albemarle County, Current edition.
- ⁷ Adams, p. 68.
- ⁸ Communication from Mr. Chamberlain.
- ⁹ TD ATF 79, Napa Valley Viticultural Area.
- ¹⁰ USDA General Soil Map, Albemarle County, attached.
- ¹¹ Jefferson and Wine, p. 11
- ¹² Soil Map, attached.
- ¹³ Excerpts from USDA Soil Survey of Albemarle County, current edition.
- ¹⁴ US Dept of Commerce, National Oceanic and Atmospheric Administration, Narrative Climatological Summary, 1970.
- ¹⁵ Chart, courtesy, Dr. P. Michaels, State Climatologist, Dept. of Environmental Sciences. University of Virginia, attached.
- ¹⁶ Chart, Virginia State Climatologist, attached.

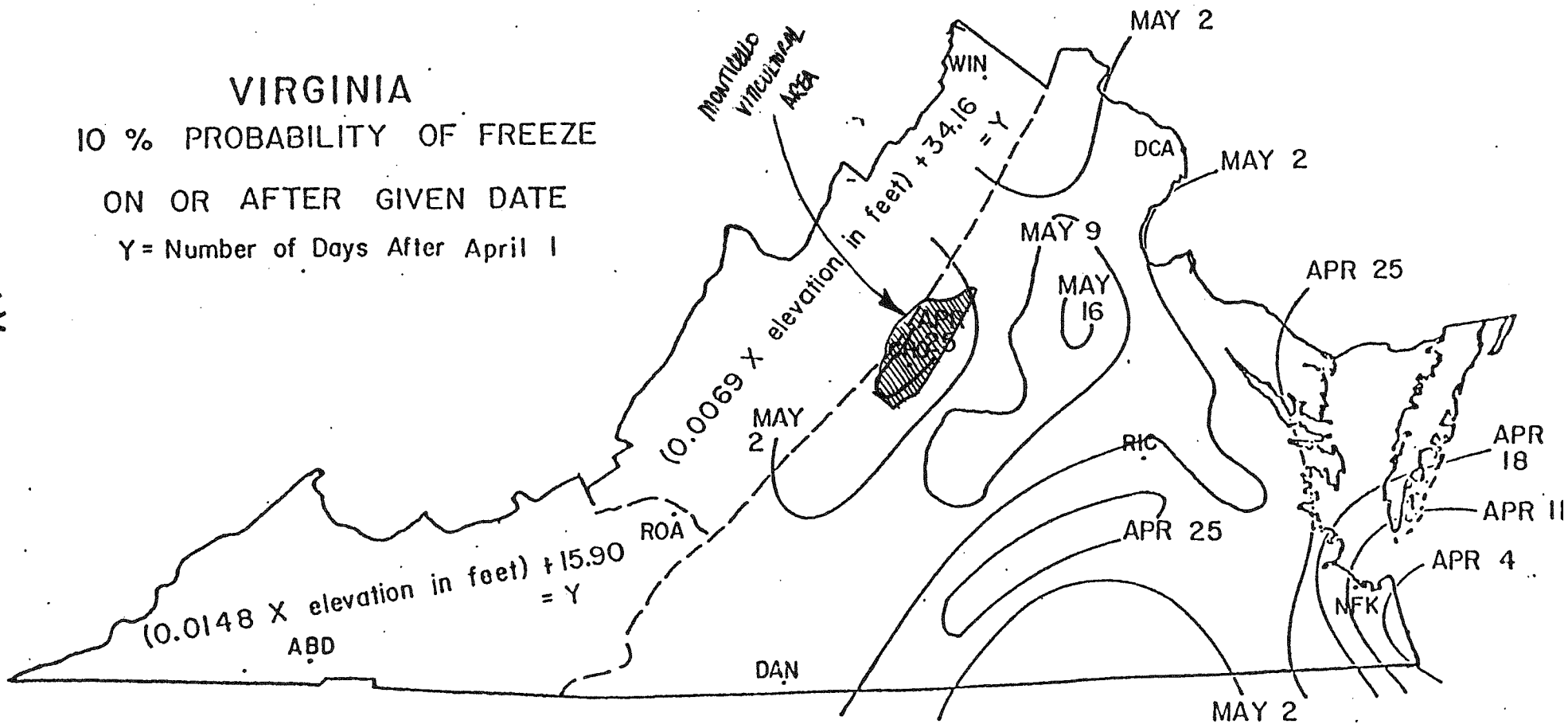
ATTACHMENT #14

VIRGINIA

10 % PROBABILITY OF FREEZE

ON OR AFTER GIVEN DATE

Y = Number of Days After April 1



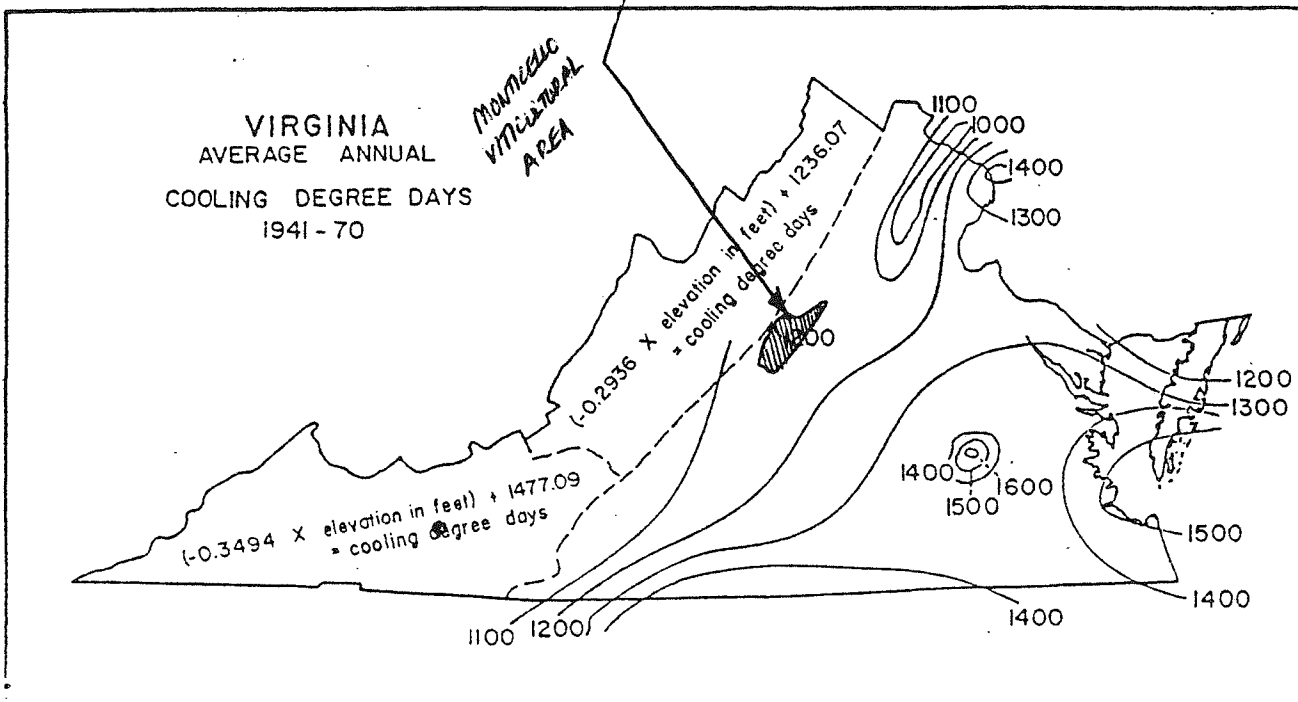
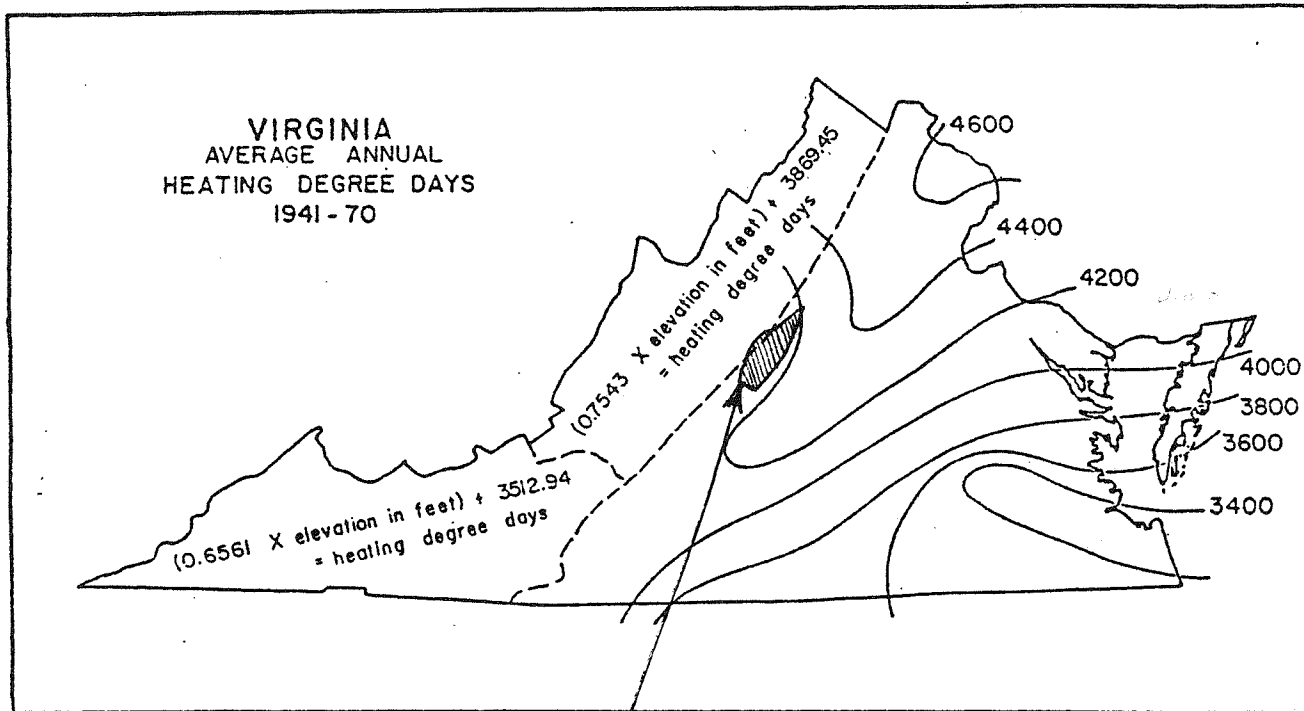
VIRGINIA CLIMATE ADVISORY



Volume 4

Number 1

Spring, 1980



Attachment 10

SOIL ASSOCIATIONS

AREAS DOMINATED BY STONY SOILS WITH BROWN, OR DARK BROWN, MEDIUM TEXTURED SURFACE SOIL AND BROWN OR REDDISH BROWN FRIABLE CLAY LOAM SUBSOIL.

CLIFTON-PORTERS ASSOCIATION; Moderately deep to shallow, well to excessively drained soils on steep slopes of the Blue Ridge Mountains and foothills.

AREAS DOMINATED BY SOILS WITH BROWN OR DARK REDDISH BROWN, MEDIUM TEXTURED SURFACE SOIL AND BROWN TO DARK RED, ACID, CLAYEY SUBSOIL.

HAYESVILLE-DYKE-TUSQUITEE ASSOCIATION; Deep, well drained, gently sloping to steep soils on foothills and colluvial footslopes.

AREAS DOMINATED BY SOILS WITH LIGHT COLORED, MEDIUM TEXTURED SURFACE SOIL AND REDDISH OR YELLOWISH, ACID, CLAYEY SUBSOIL.

CECIL-LLOYD-APPLING ASSOCIATION; Deep, well drained, gently sloping to moderately steep soils on dissected Piedmont uplands.

CULPEPER-ALBEMARLE-LOUISBURG ASSOCIATION; Deep to shallow, well drained, gently sloping to steep soils on dissected Piedmont uplands.

AREAS DOMINATED BY SOILS WITH DARK REDDISH BROWN, CLAYEY SURFACE SOIL AND DARK RED CLAY SUBSOIL.

DAVIDSON-STARR ASSOCIATION; Deep, well drained, gently sloping to steep soils on dissected Piedmont uplands.

DAVIDSON-STONY LAND ASSOCIATION; Moderately deep to shallow, well drained soils on steep mountain slopes.

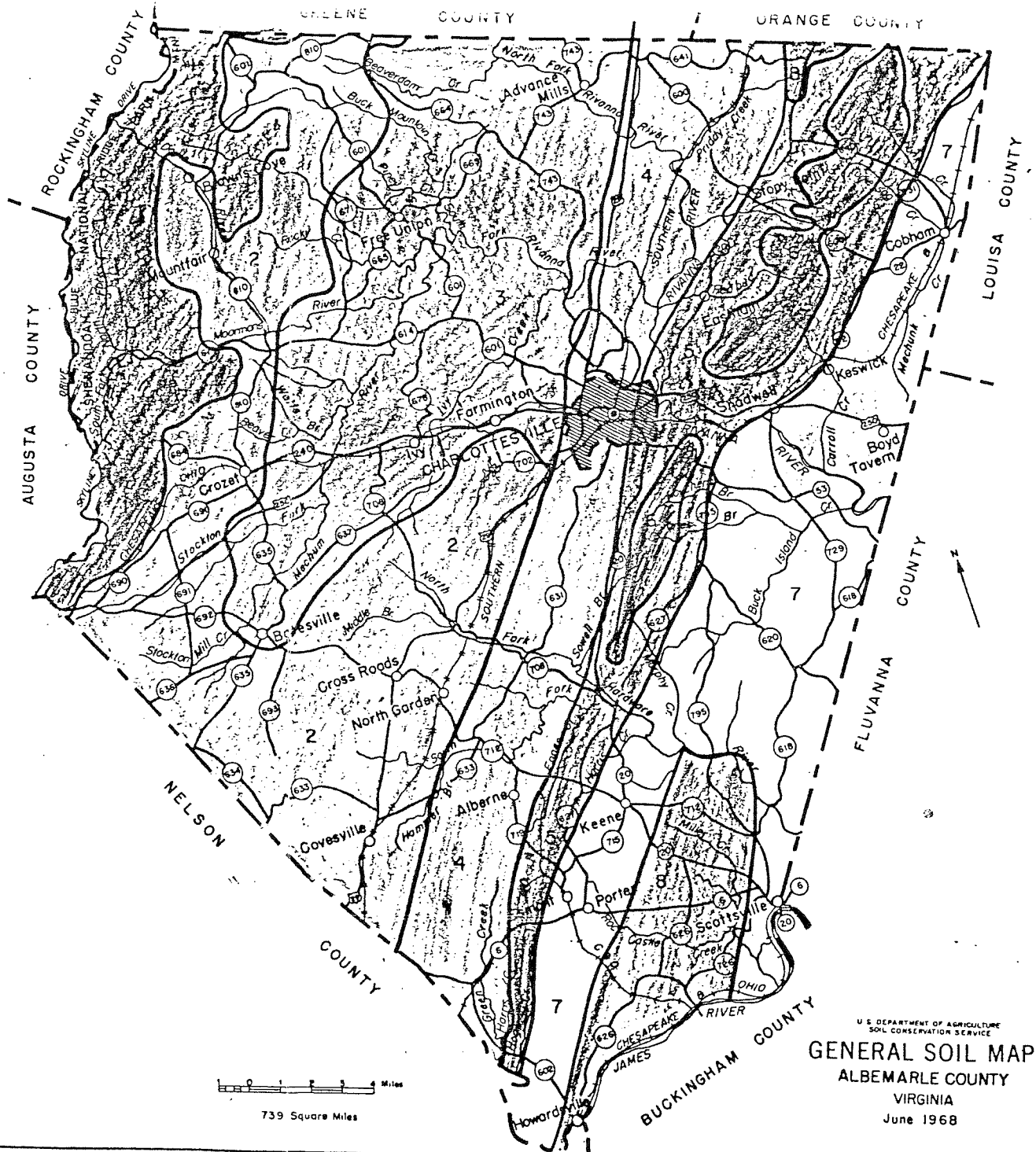
AREAS DOMINATED BY SHALLOW SOILS WITH LIGHT COLORED, MEDIUM TEXTURED SURFACE SOIL AND LITTLE OR NO SUBSOIL.

MANTEO-NASON-TATUM ASSOCIATION; Shallow to moderately deep, excessively well to well drained, gently sloping to steep, very strongly acid soils on dissected Piedmont uplands.

AREAS DOMINATED BY SOILS WITH REDDISH BROWN, MEDIUM TEXTURED SURFACE SOIL AND DARK RED TO WEAK RED, ACID, CLAYEY SUBSOIL.

BUCKS-PENN ASSOCIATION; Deep to shallow, well drained, gently sloping to moderately steep soils on Piedmont lowlands.

This map is designed to provide a general picture of the soils in Albemarle County. It should be helpful in planning for more detailed soil investigations. The names of soil series used on this map are tentative and subject to change.



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GENERAL SOIL MAP
ALBEMARLE COUNTY
VIRGINIA
June 1968

Chief, Regulations and Procedures
Division
Bureau of Alcohol, Tobacco and Firearms
P. O. Box 385
Washington, D. C. 20044-0385

January 14, 1982

Dear Sir:

The accompanying document is a petition to establish the Monticello Viticultural Area, Virginia comprised of portions of Albemarle, Nelson and Orange counties located in the Commonwealth of Virginia.

The petition is signed by all members of the Board of Directors of the Jeffersonian Wine Grape Growers Society. The primary goal of the Society is to promote good fellowship and exchange of ideas among persons interested in viticulture and oenology. Since its inception two years ago the Society has functioned without pecuniary gain or profit.

Noteworthy among its accomplishments, the Society established a liaison with Virginia Polytechnic Institute and State University, assembled soil and climate data descriptive of the encompassing geographic area and initiated various educational forums.

Currently, twenty percent of our one hundred ten members are involved in nurturing their vineyards and five of these members also operate bonded wineries within the boundaries of the proposed Monticello Viticultural Area, Virginia. These five wineries represent one third of the total number of bonded wineries in the Commonwealth of Virginia.

Each Society member was mailed an invitation to provide climate, soil, elevation and vineyard census data to be included in this petition. The response was very encouraging and as your research progresses we trust these scientific data coupled with our historical section will aid in establishing the Monticello Viticultural Area, Virginia.

Chief, Regulations and Procedures Division
Bureau of Alcohol, Tobacco and Firearms

Page 2

Kindly address all comments to:

David A. Mefford

Richmond, Virginia 23235

David A. Mefford
David A. Mefford
Bacchanal Vineyards

Respectfully submitted

Claire Keeler
Claire Keeler, Colonel
U.S. Army Retired
Burnley Vineyard

Felicia W. Rogan
Felicia W. Rogan
Oakencroft Vineyard
President, J.W.G.G.S. *

* *Gabrielle Rausse*
Gabrielle Rausse, PhD
Barboursville Winery Inc.
BW Va. 31

Fredrich E. Gignoux III
Fredrich E. Gignoux III
Charlottesville Vineyards
Vice President-Secretary J.W.G.G.S.

John O. Sherman
John O. Sherman, Captain USN Ret.
Chermont Vineyard
BW Va. 35

E. Gerald Tremblay
E. Gerald Tremblay
Chateau Tremblay

John Marquis Sr.
John Marquis, Sr.
Blenheim Farm Vineyard
Treasurer J.W.G.G.S.

Bernard Peyton Chamberlain
Bernard Peyton Chamberlain, Esq.

*Jeffersonian Wine Grape Growers Society

- (i) Evidence that the name of the viticultural area is locally and/or nationally known.

The name "Monticello" of the proposed Monticello Viticultural Area is widely known both nationally and internationally, not only as a National Landmark, but also as the site of early viticultural efforts in the United States. From the very time Mr. Jefferson began clearing, leveling and building his family estate, Monticello, he was and continued to be interested in everything pertaining to the production, merchandising, and the enjoyment of wine. He was clearly the greatest public relationist for wine of his time.

Soon after the establishment of Monticello, Dr. Filippo Mazzei imported 10,000 grape vines from Champagne, Burgundy, Lanquedoc, Nice and Sicily. Of these about 1,000 vines were selected for shipment to Virginia. Dr. Mazzei planted selected vines and constructed a house atop a hill to be called "Colle" on land provided by Mr. Jefferson. Colle was sold in 1795 and then demolished in 1933, but in 1982, after more than two hundred years, the vineyards around Colle are to be replanted by yet another personable young man from Italy. Perhaps twentieth Century historians will recall the untiring efforts of our contemporary Italian friend. Mr. Jefferson wrote, "The Italian Mazzei who came here to make wine fixed on these South West mountains, having a South East aspect, and abundance of lean and meagre spots of stony and red soil, without sand resembling extremely, the Cote of Burgundy from Chambertin to Montrachet where the famous wines of Burgundy are made. I am inclined to believe he was right in preferring the South Eastern face of the ridge of mountains. It is the first ridge from the sea, begins on the north side of the James River, and extends north eastward, thro' the state . . .".⁽¹⁾ Dr. Mazzei's viticultural activity was short lived because of the American Revolution.

After the Revolution, grape cultivation continued in the proposed Monticello Viticultural Area, Mr. Jefferson made extensive plantings at Monticello and Colonel Monroe, then the Secretary of State, whose estate was within 3 miles of Monticello had also planted a collection of vines, which he had selected and brought from France to plant at Ash Lawn.

In 1835, Dr. D. N. Norton⁽²⁾ propagated a domestic non-foxy native blue grape that eventually bore his name. The Norton grape became the foundation of Virginia Claret. The Monticello Wine Company in Charlottesville, Va. became nationally and internationally known as their wines won a gold medal in Vienna

in 1873 and a silver medal in Paris, 1878. Other medals were awarded at the Paris Universal Expositions of 1889 and 1900. The grapes that produced the Norton-Virginia Claret came from vineyards in the proposed Monticello Viticultural Area. During this period Charlottesville became known as the "Capital of the Virginia Wine Belt" and the Rivanna River as the "Rhine of America".

The early 1900's showed a drastic decline in the grape and wine industry in the Monticello area, because of Virginia's statewide prohibition of 1914 and the Volstead Act of 1920. However, in 1934 after Repeal an attempt was made to revive the industry via the Monticello Grape Growers Co-operative Association. The sites selected by Dr. Mazzei, Mr. Jefferson and the old Monticello Wine Company were to be replanted; however, the depression and the imminence of World War II again forestalled resurgence of the wine industry in the Monticello area.

More recently the Barboursville Plantation, the home designed by Mr. Jefferson for his friend, former Governor and U.S. Senator, James Barbour, was acquired by Mr. Cantine Zonin S.p.A. of Gambellara (Vicenza), Italy. Barboursville Vineyards began their operations in the Spring of 1976 with plantings of Chardonnay, White Riesling, Cabernet Sauvignon, and Merlot. Presently Barboursville Vineyards has 15 acres of various vinifera and their first wines were made in 1978.

In 1978, three thousand grafted vines, mainly White Riesling, were planted by the Rapidan River Vineyards on the 1500 acre Island View Farm owned by Dr. Gernard W. R. Guth of Hamburg, West Germany. Presently planted are 27,000 vinifera vines (White Riesling, Chardonnay, Gewurztraminer and Pinot Noir) on 25 acres. The wines are 100% varietal, made in the finest German tradition.

Also within this proposed viticultural area, Paul Masson Vineyards of Saratoga California have purchased land near Charlottesville. Presently experimental plantings are being planted with plans to establish an eastern vineyard and winery.

These are just representative of the interest and growth of the Grape and Wine Industry in the Monticello area. Encouraged by this revived interest and the success, particularly the Barboursville Vineyard, the proposed Monticello Viticultural Area, presently has 27 vineyards producing predominantly Vinifera grapes on approximately 160 acres on which more than 100,000 vines have been planted.

- (ii) Historical or current evidence that the boundaries of the viticultural area are as specified in the application.

The western boundary of the proposed Monticello Viticultural Area is characterized by the Central Virginia Blue Ridge Mountains which were formed in the early Paleozoic, about 500 million years ago.⁽³⁾ These mountains possess many outcroppings of Catoctin Greenstone, a volcanic rock which spread over a large area of Virginia and is responsible for the dark red colored soils on which many of the vineyards are planted.

To the South and East the boundaries are identified by the James River and one of its larger tributaries, the Tye. The lands east of the James gradually slope away to the Piedmont Plateau.

As in the West, the northern boundary consists of mountains and the meandering Rapidan River and one of its tributaries, Mountain Run.

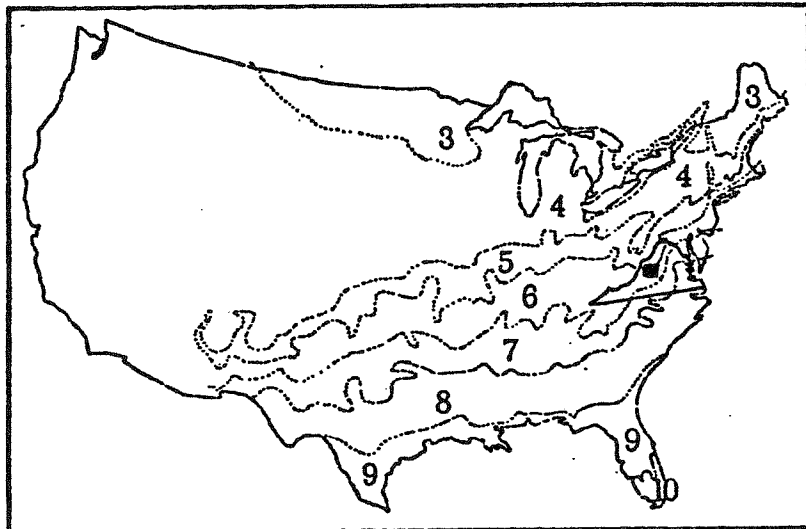
Very much in the center of this setting is Monticello Mountain rising to an elevation of over 800 feet, standing out as both a geographical and historical center of activity for the proposed Monticello Viticultural Area.

The area encompassed by these boundaries is approximately 1250 square miles.

(iii) Evidence relating to the geographical features (climate, soil, elevation, physical features, etc.) which distinguish the viticultural features of the proposed area from surrounding areas.

Temperature

The oldest and most widely used map to define plant hardiness zones in the United States is the Arnold Arboretum Map⁽⁴⁾ prepared by Harvard University. The map is based upon average annual lowest temperature zones. Map number one⁽⁵⁾ is a reproduction of the Arnold Arboretum Map with the western zones removed to clarify the east and specifically the Commonwealth of Virginia. The Monticello Viticultural Area is illustrated by a small black rectangle in zone six.



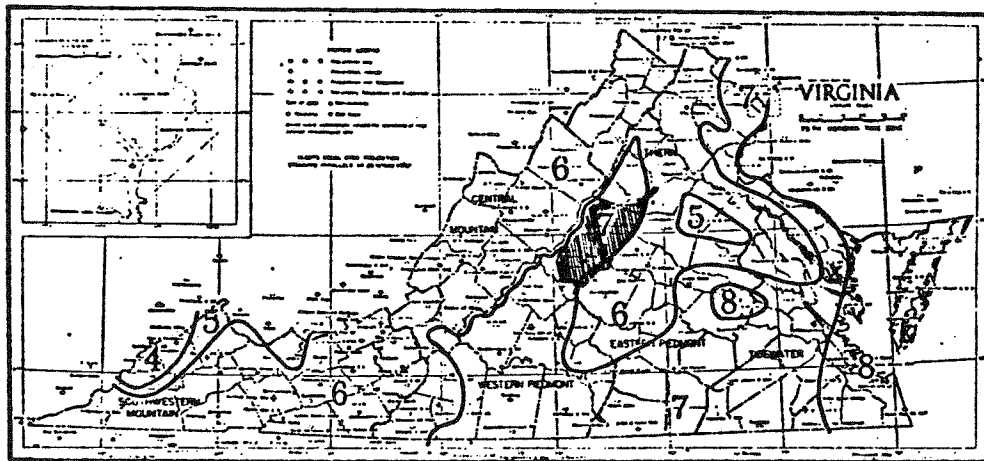
Map 1

In January 1979 the Office of the Virginia State Climatologist published a more detailed series of maps using Arnold Arboretum temperature ranges.

<u>Hardiness Zone</u>	<u>Temperature Range</u>
4	-20° to -10°F
5	-10° to - 5°F
6	- 5° to + 5°F
7	+ 5° to +10°F
8	+10° to +20°F

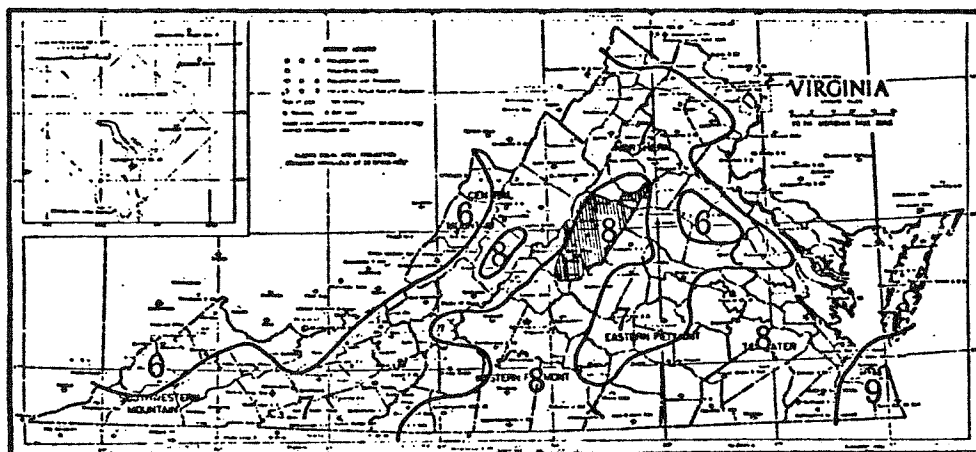
The following maps two, three and four are considerably more accurate because data from fifty weather stations were used as compared to about half a dozen in Virginia for the national map. The shaded area identifies the Monticello Viticultural Area on all three maps and discloses several important climatic features.

Map number two places the Monticello Viticultural Area in Zone 7 (+5° to +10°F) rather than in Zone 6 (-5° to +5°F) thus providing somewhat better cold weather protection than locations to the west or east.



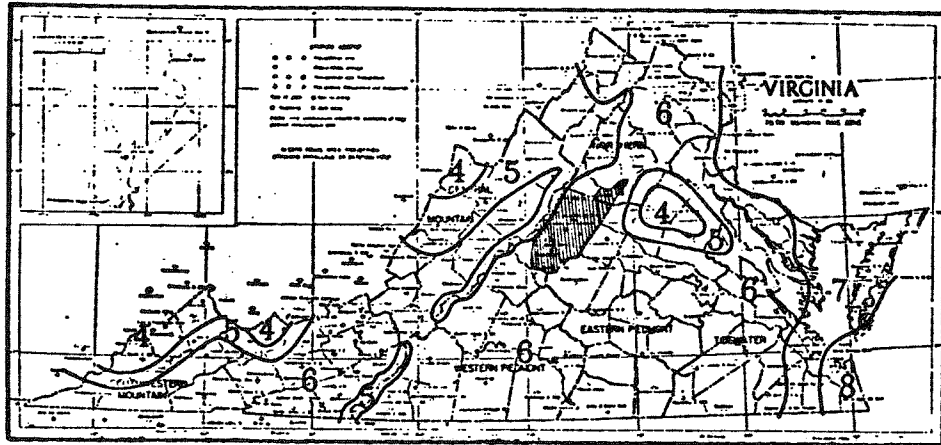
Map 2

The third map discloses that in the foothills of the east slope of the Blue Ridge Mountains, land at an elevation between 1500 and 400 feet is upgraded to Zone 8 (+10° to +20°F) if the fifteen warmest winters in a century were the normals.



Map 3

On the lower end of the temperature spectrum the fourth map places the Monticello Viticultural Area in Zone 6 (-5° to +5°F) if the fifteen coldest winters in a century were the normal. Still a suitable zone for viticulture.



Map 4

In the notes Thomas Jefferson entered in his Garden Book⁽⁶⁾ he observed that "on the higher parts of mountains, where it is absolutely colder than in the plains on which they stand, frosts do not appear so early by a considerable space of time in Autumn and go off sooner in the Spring, than in the Plains".

Dr. Bruce Hayden, State climatologist⁽⁷⁾ explained in modern terminology the phenomenon Jefferson observed in the early 1800's. Dr. Hayden studied temperature data from twenty Octobers between 1951 and 1971 and found 37 days in which freezing occurred at low elevations. His chart reproduced below (Chart 1) shows that only five of the thirty seven days had temperatures above 32°F at an elevation of 350 feet but at 600 feet, 32 of the 37 days were above 32°F.

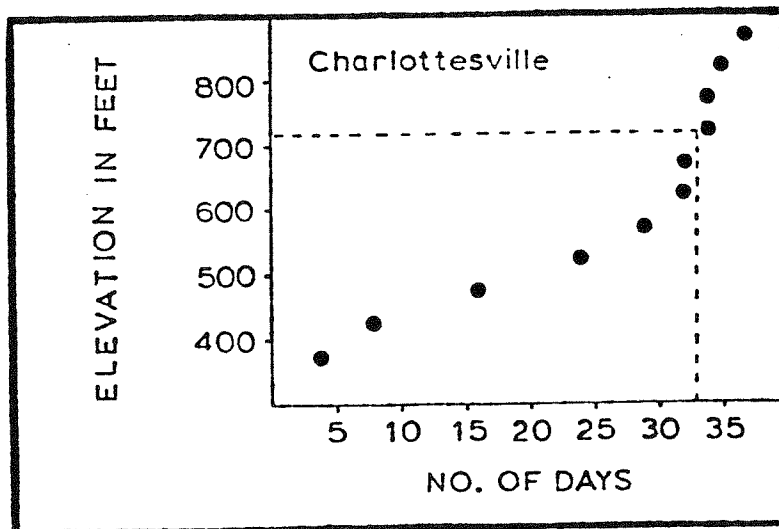
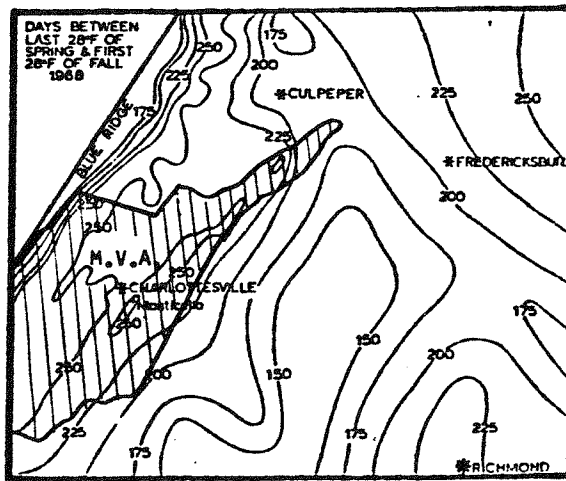


Chart 1

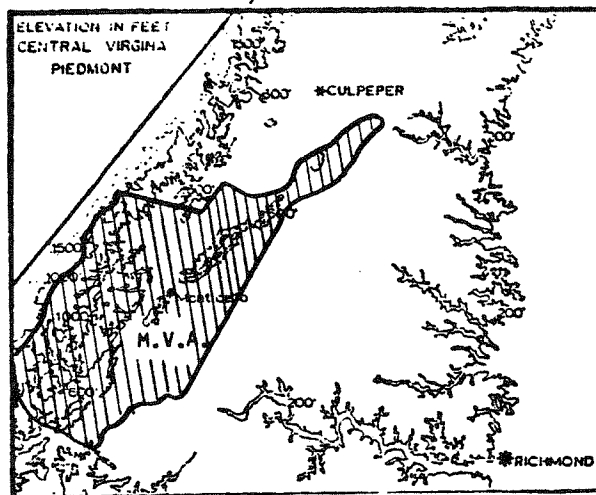
While the elevation effect is dramatic for 32°F it is even more dramatic for the occurrence of temperatures near 28°F. The fifth map indicates the number of days between the last 28°F of Spring and the first 28°F of Fall.



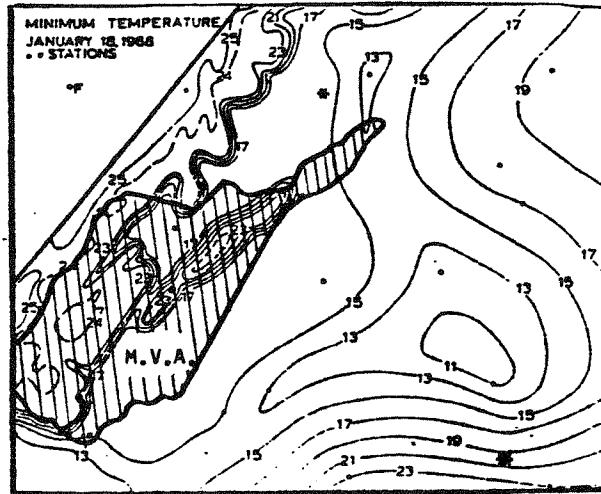
Map 5

The span is from 220 to 250 days in the Monticello Viticultural Area (shaded M.V.A.) and drops to 175-150 days to the north, east, south and west. Indeed, a striking and important difference of up to three months. Early Spring frosts can damage delicate new buds and early Fall frosts can force photosynthesis to cease prematurely.

In a related experiment Dr. Hayden and his staff recorded minimum temperatures from various weather stations and the known relationship between elevation and minimum temperatures. Maps six and seven clearly illustrate the higher temperatures on January 18, 1968 within the shaded Monticello Viticultural Area (M.V.A.) and the lower temperatures to the east.

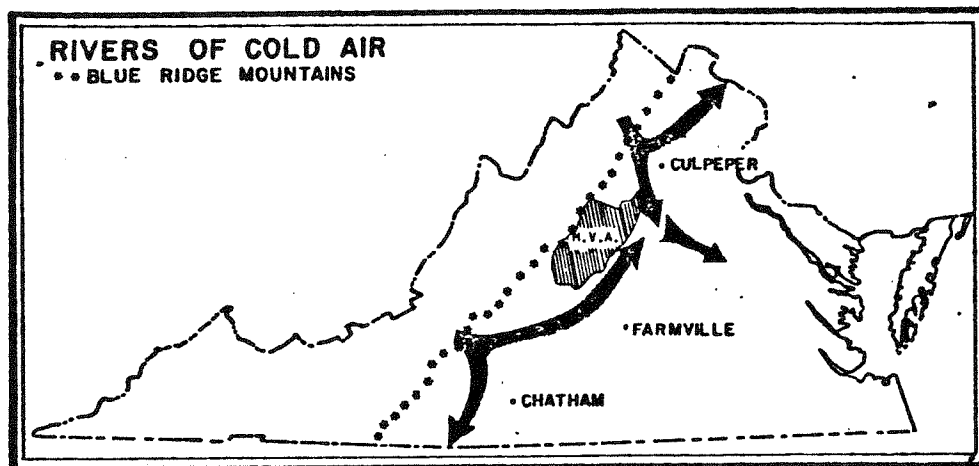


- Map 6



Map 7

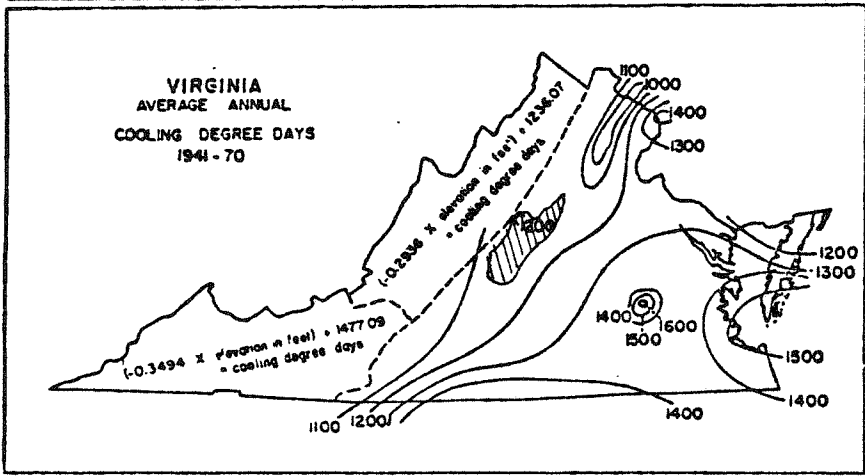
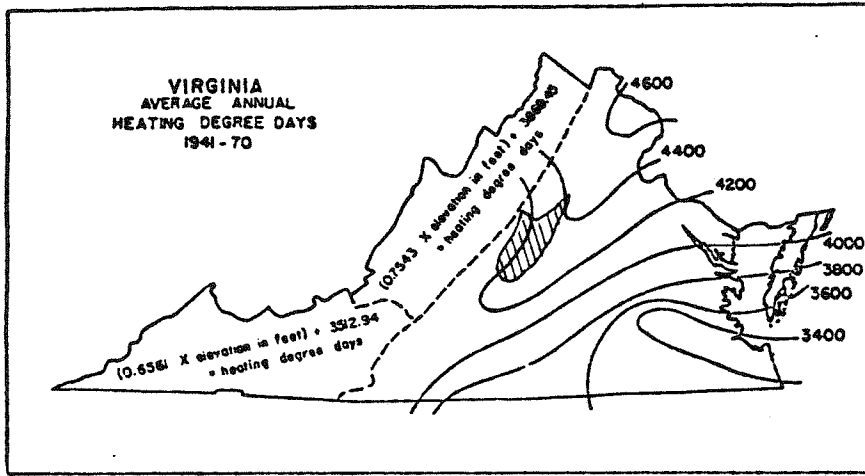
This condition can be explained by Rivers of Cold Air⁽⁸⁾ usually coming from the Northwest that spill through two major low points in the Blue Ridge Mountains; Front Royal in the north and Roanoke to the south. The cold air tends to flow at a constant elevation through these corridors where temperatures are 4° to 5° F colder than the surrounding area. Map number eight illustrates the protection afforded by the Blue Ridge Mountains to the west.



Map 8

Rainfall

In his Weather Memorandum Book⁽⁹⁾ Jefferson noted that between the years of 1772 and 1777 there was an average annual accumulation of 47 inches of rain. The survey conducted by the Jeffersonian Wine Grape Growers Society included rainfall data from owners of fifteen vineyards in the Monticello Viticultural Area. The average annual rainfall reported was 42.4 inches with a range of 39.5 to 44.0 inches; amazingly close to Mr. Jefferson's measurements of two hundred years ago.



Office of the State Climatologist/Clark Hall/The University of Virginia
Charlottesville VA 22903

Maps 9 and 10

Still another way to express climatic conditions is to express temperature in heating or cooling degree days. Maps 9 and 10 illustrate heating degree days of 4000 to 4400 and cooling degree days of 1100 to 1200 are to be found in the Monticello Viticultural Area while different conditions exist in other parts of Virginia.

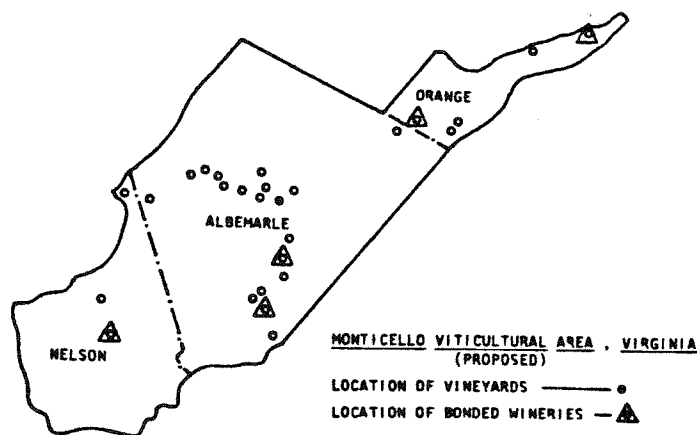
Acid Rainfall

The University of Virginia⁽¹⁰⁾ has been a leader in studies of the effects of acid rainfall. Although much research needs yet to be accomplished, acid rainfall could become a problem of Virginia's developing viticultural areas.

Upwind from Virginia, the Ohio Valley supports a high concentration of sulfur-emitting industries. Pollutants generated there tend to drift over Virginia, and fall as acid precipitation when rain systems move towards Virginia. The windward sides of Virginia's mountains must bear the brunt of this acid rain. The leeward side of the Blue Ridge Mountains should receive less acid rain because initial rainfall from a given airmass is likely to be more acidic than that which falls later.

Following this selection each of the one hundred ten members of the Jeffersonian Wine Grape Growers Society was mailed a Vineyard Census Form and given an opportunity to provide soil, climate, elevation, location and vine census information.

Data were received from twenty-four of the twenty-seven members known to have vineyards. This response represented eighty-nine percent and was considered quite encouraging and demonstrated significant interest in this petition.



Map 13

Of the originally selected six vineyards, five are commercial grape producers and the owners of four of these also operate bonded wineries.

An examination of the data supplied by these six vineyards revealed that each owner had previously researched the soil type at his location.

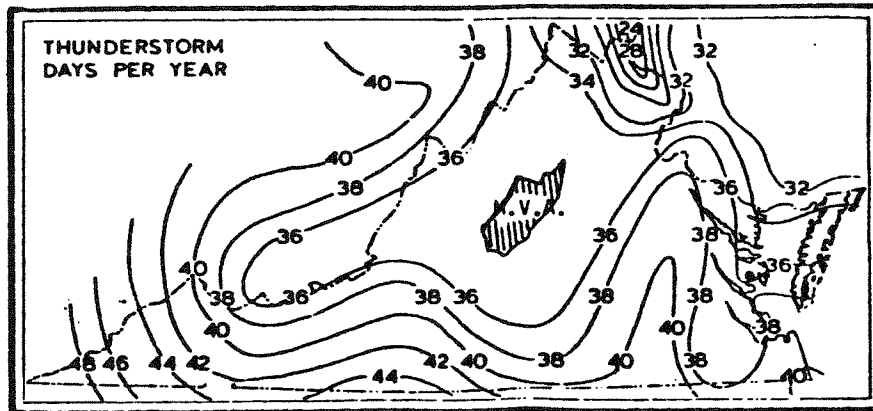
Two meetings were then held with members of the Soil Conservation Service in Richmond, Virginia to discuss similarities among these soil types. The discussions centered around the soil classification plan utilized since 1965 by many American soil scientists, entitled "Soil Classification: A Comprehensive System, 7th Approximation". (12)

Beginning with the highest class and descending to the lowest all of the soils fall into the following scheme.

<u>Order</u>	<u>Suborder</u>	<u>Great Group</u>
Ultisols	Udults	Hapludults
		Rhodudults
		Fragiudults

All are considered very old soils of humid climates usually with horizons of clay accumulation and are further classified

Additional studies show that rainfall originating in showers and thunderstorms, as opposed to general frontal rains, are the most acidic. Map number eleven places the Monticello Viticultural Area in a zone of relatively low thunderstorm activity.



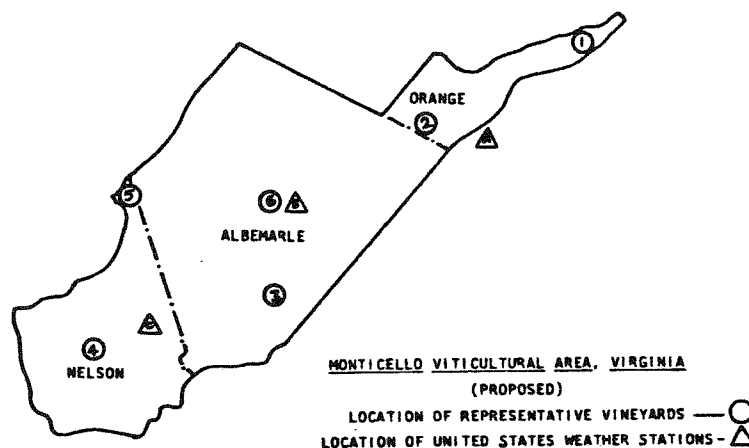
Map 11

The University of Virginia⁽¹¹⁾ conducted another major project in the Shenandoah National Park and discovered that the cambrian shales of the southwestern portion of the Park have the lowest neutralizing capability which is further emphasized by thin soil cover. Fortunately, vineyards in the Monticello Viticultural Area are planted on deep, well drained soil deposits which possess higher neutralizing potential.

Mountain shelter, low thunderstorm activity and deep well drained soils appear to place the Monticello Viticultural Area in a uniquely protected location.

Soils

Six vineyards were selected as geographically representative of the Monticello Viticultural Area. Five of the vineyards are located in the periphery of the area and the sixth one just west of Charlottesville, the center.



Map 12

as members of lower categories described in the following paragraphs.

The descriptions are from the National Cooperative Soil Survey of the United States (1976) and supplied through the courtesy of the Soil Conservation Service.

NASON SERIES

The Nason series consists of deep, well drained soils on uplands that formed in material weathered from schist. They are nearly level to steep soils on uplands. They typically have silt loam A horizons, silty clay B2t horizons, channery silt loam C horizons, and schist bedrock at 50 inches.

Taxonomic Class:

Clayey, mixed, thermic Typic Hapludults

Solum Thickness:

Ranges from 25 to 50 inches. The solum is strongly to very strongly acid unless limed.

Geographic Setting:

The mean annual air temperature is greater than 57°F, and the average precipitation ranges from 40 to 50 inches. Length of growing season ranges from 195 to 240 days.

RAPIDAN SERIES

Soils of the Rapidan series are deep and well drained. They formed in material weathered primarily from basic rocks. They are nearly level to steep soils on ridge-tops and side slopes of Triassic Basins in the Piedmont Physiographic Province. They typically have silt loam, loam, silty clay loam or clay loam A horizons. The B horizon is commonly clay but includes silty clay loam, clay loam and silty clay. The C horizon is variable in color, texture, coarse fragments and thickness.

Taxonomic Class:

Clayey, mixed mesic Typic Rodudults.

Solum Thickness:

Ranges from 100 to 150 cm. The soil is strongly acid or medium acid in the solum unless limed, and very strongly acid to medium acid in the C horizon.

Geographic Setting:

The mean annual air temperature ranges from 9 to 14°C; mean annual precipitation is 95 to 100 cm; and the frost-free days range from 153 to 192.

DYKE SERIES

Soils of the Dyke series are deep and well drained. They formed in colluvium. They are nearly level to steep soils on foot slopes, fans and high terraces. They typically have silt loam or loam and cobbly or very cobbly analogues where not eroded A horizons. The Bt horizon is commonly clay but includes heavy silty, clay loam and silty clay. The C horizon is commonly cobbly and varigated in color.

Taxonomic Class:

Clayey, mixed, mesic Typic Rhodudults

Solum Thickness:

Ranges from 75 to more than 150 cm. The soil is very strongly acid or strongly acid in the solum unless limed, and very strongly acid to medium acid in the C horizon.

Geographic Setting:

The mean annual temperature ranges from 9 to 14°C; mean annual precipitation is 95 to 110 cm and the frost-free days range from 183 to 192.

BUCHANAN SERIES

The Buchanan series consists of deep, moderately well to somewhat poorly drained soils on uplands. They are gently sloping to moderately steep concave mid and lower footslopes. The A horizon ranges from very dark gray to light brown. It is silt loam or loam. The B horizon is silt loam, clay loam or sandy clay loam or gravelly analogues. The C horizon is variable in color, and texture is similar to the B horizon.

Taxonomic Class:

Fine-loamy, mixed mesic Typic Fragiudults.

Solum Thickness:

Ranges from 40 to 60 inches. The soil ranges from extremely to strongly acid throughout where unlimed.

Geographic Setting:

The average annual temperature ranges from 47° to 59°F and the growing season from 140 to 170 days.

A review of General Soil Maps from Albermarle, Nelson and Orange(13) Counties (Maps 14, 15 and 16) discloses the following soil deposits common among the three counties.

Albemarle

Davidson
 Dyke
 Nason
 Rapidan
 Buchanan *

Nelson

Davidson
 Dyke
 Nason

Orange

Davidson

 Nason
 Rapidan
 Buchanan

*Found only on detailed soil maps

SUMMARY OF CLIMATE AND SOIL OF
 THE SIX REPRESENTATIVE VINEYARDS

Map Location	Vineyard	Elevation Above Sea Level	Average Annual Rainfall	Temperature °F			Primary Soil Type
				High	Low	Aver.	
1	Rapidan	350	40	99	-10	58	Nason
2	Barboursville	600	41	106	-7	58	Rapidan
3	Chermont	530	43	102	-2	60	Rapidan
4	La Abra	820	42	102	-5	56	Davidson
5	Bacchanal	800	40	101	0	56	Dyke
6	Charlottesville	560	44	92	+5	55	Buckhanan
-	U.S. Weather Stations	---	--	--	--	--	-----
A	Orange	515	39	106	-9	57	-----
B	Albemarle	870	44	107	+3	57	-----
C	Nelson	800	39	N.A.	N.A.	N.A.	-----

N.A. = Not Available

SOIL ASSOCIATIONS

AREAS DOMINATED BY STONY SOILS WITH BROWN, OR DARK BROWN, MEDIUM TEXTURED SURFACE SOIL AND BROWN OR REDDISH BROWN FRIABLE CLAY LOAM SUBSOIL.

1. CLIFTON-PORTERS ASSOCIATION: Moderately deep to shallow, well to excessively drained soils on steep slopes of the Blue Ridge Mountains and foothills.

AREAS DOMINATED BY SOILS WITH BROWN OR DARK REDDISH BROWN, MEDIUM TEXTURED SURFACE SOIL AND BROWN TO DARK RED, ACID, CLAYEY SUBSOIL.

2. HAYESVILLE-DYKE-TUSQUITEE ASSOCIATION: Deep, well drained, gently sloping to steep soils on foothills and colluvial footslopes.

AREAS DOMINATED BY SOILS WITH LIGHT COLORED, MEDIUM TEXTURED SURFACE SOIL AND REDDISH OR YELLOWISH, ACID, CLAYEY SUBSOIL.

3. CECIL-LLOYD-APPLING ASSOCIATION: Deep, well drained, gently sloping to moderately steep soils on dissected Piedmont uplands.

AREAS DOMINATED BY SOILS WITH DARK REDDISH BROWN, CLAYEY SURFACE SOIL AND DARK RED CLAY SUBSOIL.

4. CULPEPER-ALBEMARLE-LOUISBURG ASSOCIATION: Deep to shallow, well drained, gently sloping to steep soils on dissected Piedmont uplands.

AREAS DOMINATED BY SOILS WITH DARK REDDISH BROWN, CLAYEY SURFACE SOIL AND DARK RED CLAY SUBSOIL.

5. DAVIDSON-STARR ASSOCIATION: Deep, well drained, gently sloping to steep soils on dissected Piedmont uplands.
6. DAVIDSON-STONY LAND ASSOCIATION: Moderately deep to shallow, well drained soils on steep mountain slopes.

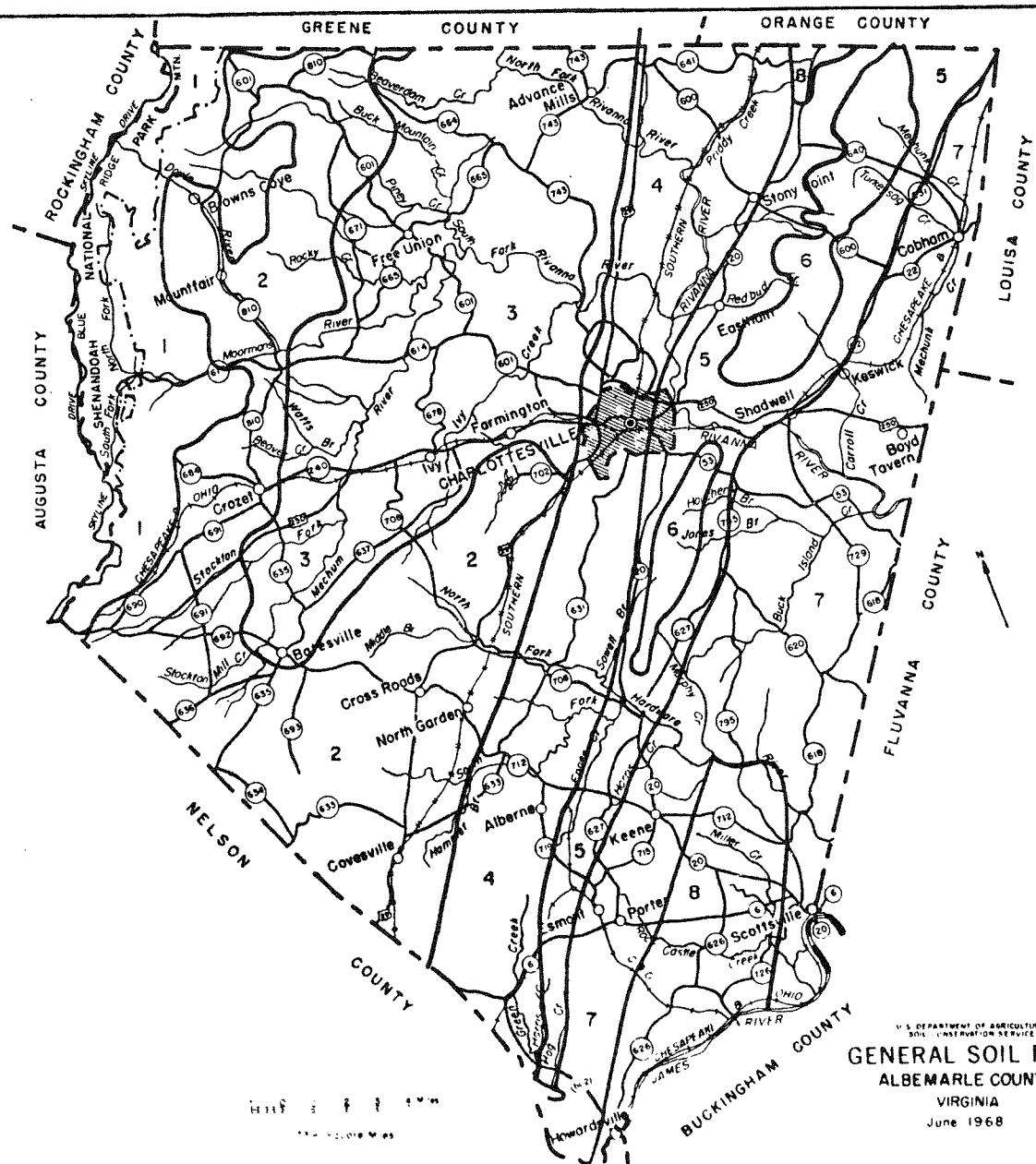
AREAS DOMINATED BY SHALLOW SOILS WITH LIGHT COLORED, MEDIUM TEXTURED SURFACE SOIL AND LITTLE OR NO SUBSOIL.

7. MANTEO-NASON-TATUM ASSOCIATION: Shallow to moderately deep, excessively well to well drained, gently sloping to steep, very strongly acid soils on dissected Piedmont uplands.

AREAS DOMINATED BY SOILS WITH REDDISH BROWN, MEDIUM TEXTURED SURFACE SOIL AND DARK RED TO WEAK RED, ACID, CLAYEY SUBSOIL.

8. BUCKS-PENN ASSOCIATION: Deep to shallow, well drained, gently sloping to moderately steep soils on Piedmont lowlands.

This map is designed to provide a general picture of the soils in Albemarle County. It should be helpful in planning for more detailed soil investigations. The names of soil series used on this map are tentative and subject to change.



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GENERAL SOIL MAP
ALBEMARLE COUNTY
VIRGINIA
June 1968

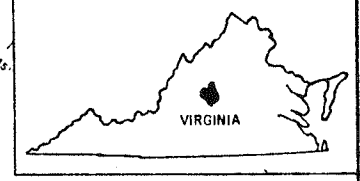
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GENERAL SOIL MAP

NELSON COUNTY

VIRGINIA

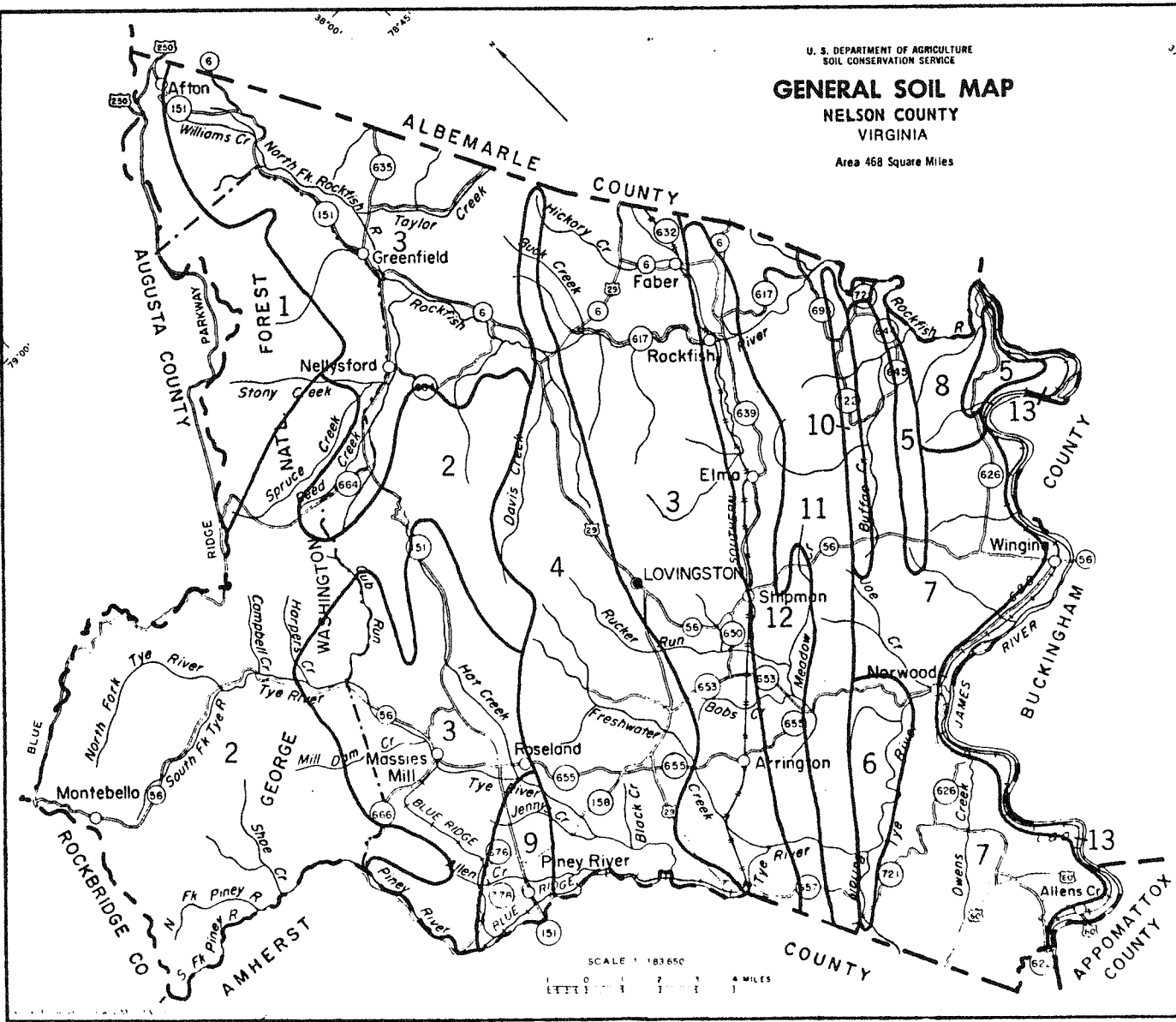
Area 468 Square Miles



SOIL ASSOCIATIONS

- 1. Areas dominated by silt loam soils with brown to dark brown loam to silt loam surface soils and brown to reddish brown friable clay loam to silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils mostly on steep slopes.
- 2. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 3. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 4. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 5. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 6. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 7. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 8. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 9. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 10. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 11. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 12. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.
- 13. Areas dominated by silt loam soils with brown to dark reddish brown loam surface soils and red to red brown to red brown silty clay subsoils. Minor inclusions of heavy loam, silty clay loam, and silty clay loam soils with moderately permeable subsoils. Mostly gentle sloping to strongly sloping relief. Forests to mostly open woodlands.

Map 15
16



SCALE 1:83,650
0 1 2 3 4 MILES

SOIL ASSOCIATIONS

AREAS DOMINATED BY MODERATELY PERMEABLE, MICACEOUS SOILS

1 Eltok-Hazel-Glenelg-Watt association: Deep to shallow, well-drained to excessively drained, gently sloping to moderately steep soils on dissected uplands

AREAS DOMINATED BY SOILS THAT HAVE A CLAYEY OR LOAMY SUBSOIL

2 Maydan-Pinkston-Wadesboro association: Deep or moderately deep, well-drained or somewhat excessively drained, gently sloping to moderately steep soils on dissected uplands

3 Bucks-Wadesboro-Penn association: Deep or moderately deep, well-drained, gently sloping or sloping soils on uplands

4 Rapidan-Bucks-Penn association: Deep or moderately deep, well-drained, gently sloping or sloping soils on uplands

AREAS DOMINATED BY MODERATELY PERMEABLE, MEDIUM ACID SOILS

5 Fauquier-Catactin-Myersville association: Deep to shallow, well-drained to excessively drained, gently sloping to steep soils on dissected uplands

AREAS DOMINATED BY MODERATELY PERMEABLE SOILS THAT HAVE A DARK-RED, CLAYEY SUBSOIL

6 Davidson association: Deep, well-drained, gently sloping to steep soils on dissected uplands

7 Rabun-Davidson-Rock land, basic association: Deep, well-drained, gently sloping to steep soils on dissected uplands

AREAS DOMINATED BY SOILS FORMED IN ALLUVIUM

8 Comus-Hiwassee-Elsinboro association: Deep, well-drained, nearly level to sloping soils on first bottoms and on stream terraces

9 Masada-Turbeville association: Deep, well-drained, gently sloping or sloping soils on stream terraces

10 Mixed alluvial land-Chewaqua association: Moderately deep to deep, poorly drained to well-drained, nearly level soils on first bottoms

AREAS DOMINATED BY EXTREMELY ACID TO VERY STRONGLY ACID SOILS THAT HAVE A CLAYEY OR LOAMY SUBSOIL

11 Nason-Tatum-Manteo association: Deep or shallow, well-drained or excessively drained, gently sloping to steep soils on dissected uplands

12 Tatum-Nason association: Deep, well-drained, gently sloping to moderately steep soils on dissected uplands

AREAS DOMINATED BY SOILS THAT HAVE A CLAYEY OR LOAMY SUBSOIL; DERIVED FROM MIXED ACID AND BASIC MATERIALS

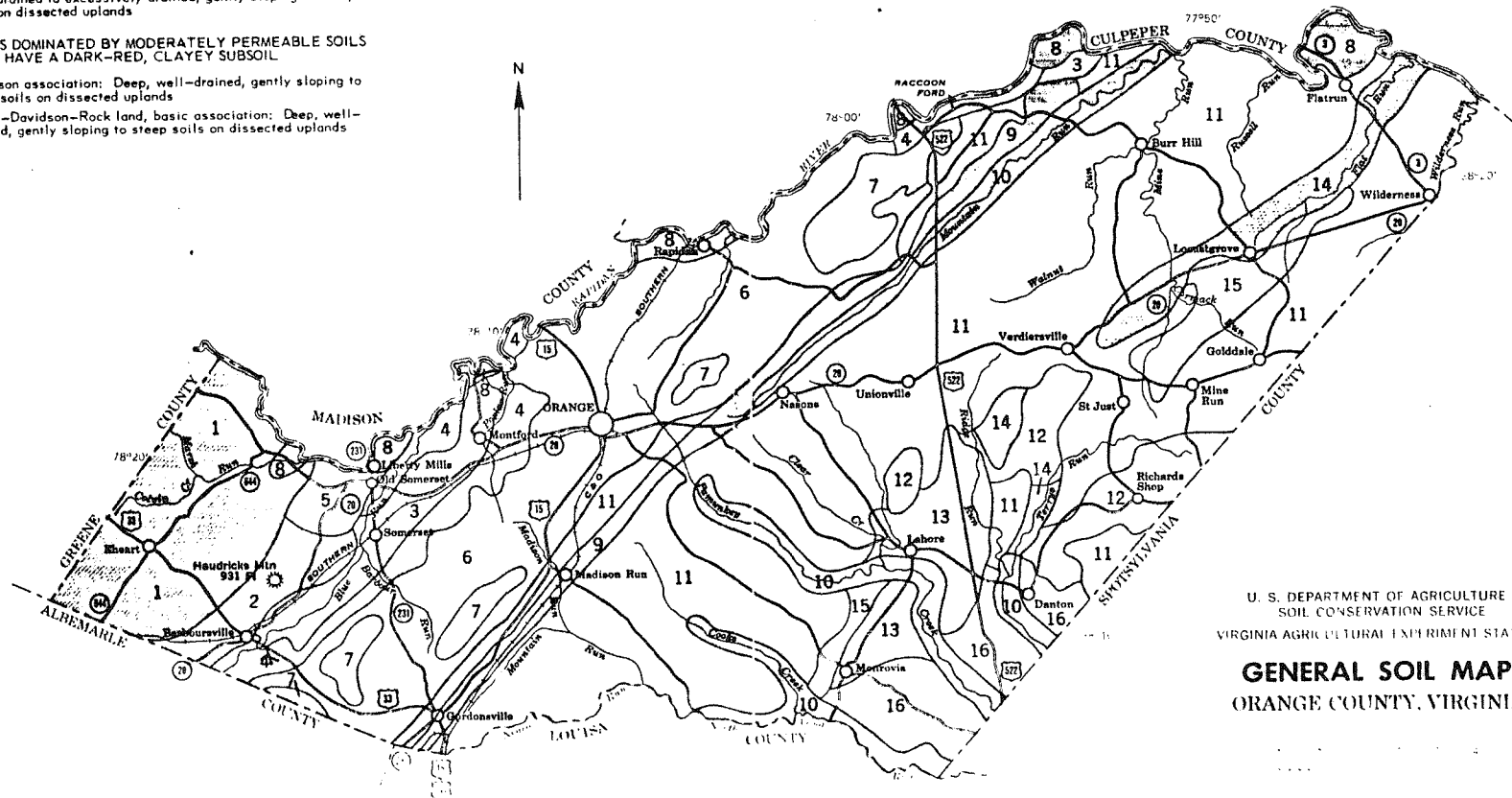
13 Lloyd-Wilkes-Orange-Iredell association: Deep or moderately deep, moderately well drained to excessively drained, nearly level to moderately steep soils on dissected uplands

14 Orange-Fluvanna-Elbert association: Deep, well-drained to poorly drained, nearly level to sloping soils on uplands

AREAS DOMINATED BY STRONGLY ACID TO VERY STRONGLY ACID SOILS THAT HAVE A MODERATELY PERMEABLE, CLAYEY OR LOAMY SUBSOIL

15 Appling-Cecil-Colfax association: Deep or moderately deep, well-drained or somewhat poorly drained, gently sloping or sloping soils on dissected uplands

16 Grover-Madison-Louisburg association: Deep or moderately deep, well-drained or excessively drained, gently sloping to moderately steep soils on dissected uplands



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
VIRGINIA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
ORANGE COUNTY, VIRGINIA

- (iv) The specific boundaries of the viticultural area based on features which can be found on United States Geological Survey (U.S.G.S.) maps of the largest applicable scale.

The Monticello Viticultural Area is located in Albemarle, Orange and Nelson Counties, Virginia. The boundaries are as follows:

- (1) Beginning at Norwood, Virginia, proceeding west ^{and northwest} along the Tye River to its intersection with the eastern boundary of the George Washington National Forest;
- (2) Thence northeast along the George Washington National Forest boundary to its point of intersection with State Rt. 664;
- (3) Thence west on Rt. 664 to its intersection with the Nelson County boundary;
- (4) Thence northeast along the Nelson County boundary to its intersection with the Albemarle County boundary ^{to} Jarman Gap; continuing northeast along the eastern boundary of the Shenandoah National Park to its intersection with the Albemarle County boundary;
- (5) Thence ^{south} east along the Albemarle County boundary to its intersection with the Orange County boundary;
- (6) Thence north along the Orange County line to its intersection with the Rapidan River;
- (7) Thence ^{southeast} northeast ^{and} along the Rapidan River to its confluence with Mountain Run;
- (8) Thence southwest along Mountain Run to its intersection ^{with} of Virginia Rt. 20; continuing southwest along Rt. 20 to the corporate limits of the town of Orange;
- (9) Thence southwest following the corporate limit line to its intersection with U.S. Rt. 15; continuing southwest on U.S. Rt. 15 to its intersection with Virginia Rt. 231 in the town of Gordonsville; continuing southwest on Virginia Rt. 231 to its intersection with the Albemarle County boundary;
- (10) Thence southwest along the Albemarle County boundary to its point of intersection with the James River;
- (11) Thence southwest along the James River to its confluence with the Tye River to the point of the beginning.

(v) A copy of the map marked with boundaries

Three U.S.G.S. maps identified as Roanoke, Charlottesville and Washington D. C. (Scale 1:250,000) have been assembled to illustrate the boundaries of the proposed Monticello Viticultural Area.

Because State Route 664 in western Nelson County is not identified on the 1:250,000 scale maps, two additional maps (Scale 1:24,000) were assembled to clearly identify and locate State Route 664. These two maps are identified as Horseshoe Mountain, Virginia and Sherando Quadrangle, Virginia.

FOOTNOTES

- (1) Thomas Jefferson, letter, Monticello 1816, Library of Congress
- (2) L. Adams, The Wines of America, second ed., 1978, page 67
- (3) R. Freer, The Geology of the Blue Ridge, Virginia Wildlife, July 1979
- (4) Harvard University, The Arnold Arboretum Map
- (5) Dr. B. Hayden, Winter Hardiness Zones for Virginia, Virginia Climate Advisory, Vol. 2 No. 9 Dec. 1978/Jan. 1979. This and other climate maps courtesy Office of the Virginia State Climatologist
- (6) Thomas Jefferson, Thomas Jefferson's Garden Book, annotated by E. M. Betts, The American Philosophical Society, Phila. 1944
- (7) Dr. B. Hayden, The Warmth of Monticello, Virginia Climate Advisory, Vol. 2 No. 7 Oct. 1978
- (8) Dr. B. Hayden, Inversions of Temperatures and Rivers of Cold Air, Virginia Climate Advisory, Vol. 2, No. 7, Oct. 1978
- (9) Thomas Jefferson, Weather Memorandum Book, 1776-1820
- (10) J. Hartzler, Acid Rainfall in Virginia, Virginia Climate Advisory, Vol. 5 No. 2 Summer 1981
- (11) J. Hartzler, Acid Rainfall in Virginia, Virginia Climate Advisory, Vol. 5 No. 2 Summer 1981
- (12) U.S.D.A., Soil Classification: A Comprehensive System, 7 TH. Approximation, 1965
- (13) U.S.D.A., Soil Conservative Service, Soil Maps of Albemarle, Nelson and Orange Counties

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