A PETITION FOR

APPELLATION OF ORIGIN DESIGNATION

"CAYUGA LAKE"

Submitted by:

Douglas and Susanna Knapp
Robert Plane

March 1, 1986
Knapp Farms Inc.
2770 Co. Rd. 128
Romulus, NY 14541
315-549-8865
607-869-9271

The preparers of this petition request that the two narrow strips of land on the East and West slopes of Cayuga Lake, as found in the counties of Seneca, Tompkins, and Cayuga in the state of New York, be considered for an appellation of origin designation to be called "Cayuga Lake".

The body of water called Cayuga Lake received it's name from the Cayuga Indians of New York state. The name also figures prominately in identifying the area in the diaries of General Sullivan during his campaign to open upstate New York land to settlers. Cayuga Lake is the name used by the first permenant settlers in Seneca County in 1789 and has remained the same to the present time. It is found in the Cornell University anthem which begins "High above Cayuga's waters...". There is no other name that can be applied to the specific area described in this proposal.

The nine commercial wineries within the proposed Cayuga Lake area recognize that they would benefit by this appellation in their marketing efforts. The wine consumer would benefit by being able to more easily identify wines coming from the Cayuga Lake area.

The proposed viticultural area, Cayuga Lake, lies within an already certified appellation of origin, the Finger Lakes, and is established as an area suitable for wine grape growing (see Appellation Finger Lakes description and Soil Survey reference material). The boundries of the proposed Cayuga Lake viticultural area have been specifically identified on USGA survey maps #AMS 5669 II-IV and physically located and evaluated on a field check by the applicants. It is the petitioners intent to further define and delineate this area within an area as having grape growing and wine making properties distinctly different from and separate from the larger Finger Lakes viticultural area.

It has long been known that the primary factors determining grape and wine quality as exemplified in the great wine growing regions of Europe such as Burgundy, Bordeaux, and the Rheingau, are soil type and micro-climate.

In defining the proposed viticultural region of Cayuga Lake, two criteria are used. One, soils must be high lime, glacial till and two, the maximum elevation may be no more than 600 feet above the surface of Cayuga Lake. This second criterion contains two parts which further delineate the land on the East and West slopes of Cayuga Lake; a) topography and b) micro-climate effects.

The Cayuga Lake basin is one of two major land formations in the Finger Lakes that resulted from glacier activity in the Pleistocene epoch. As consistantly stated in O. D. von Engeln's The Finger Lakes Region: Its Origin and Nature, the Cayuga Lake basin is separated from the second major basin, by both topography and soil type.

In all of the aforementioned European wine regions, the high lime soils have provided grapes of maximum flavor intensity and Ph and acid levels appropriate for optimum wine quality.

In the proposed Cayuga Lake viticultural region, the soils developed in glacial till are dominated by high lime and high Ph (6.5-7.5) and have unique drainage properties. They are deep, well drained to moderately well-drained soils, and have a heavy silt loam to heavy loam subsoil. (See following supporting evidence.)

1. General Soil Map of New York State as found in Soils of New York Landscapes by M. G. Cline and R. L. Marshall.
2. Seneca County Soil Survey-USDA, 1972.
3. Cayuga County Soil Survey-USDA, 1971.
4. Tompkins County Soil Survey-USDA, 1965.
5. The Finger Lakes Region: Its Origin and Nature, by O. D. von Engeln.

On the Western slope of Cayuga Lake, the Honeoye-Lima association soils clearly separate the North/South narrow strip of land from the surrounding soils. It is bordered on the North by Odessa-Schoharie-and Fulton Lucas associations (medium to fine textured soils on glacial lake or marine sediment), on the Northwest by Darien-Romulus-and Mahoning-Trumbull associations (deep to moderately deep somewhat poorly and poorly drained soils), and to the South/Southwest by Lansing-Conesus association (dominately deep well-and moderately well-drained low lime soils on glacial till).

The topography separating Cayuga Lake Basin and Seneca Lake Basin from the town of Fayette south to the town of Ovid, is low, poorly drained pockets and from the town of Ovid south, increasing elevations rise well above the temperature moderating effects of Cayuga and Seneca Lakes.

On the Eastern shore of Cayuga Lake, the same soil group (Honeoye-Lima association) begins at the southern end of the proposed viticultural area at Salmon Creek and extends northward to Aurora, New York.

Topography, however, limits the micro-climatic impact of Cayuga Lake. Higher elevations or irregular terraine interrupts the moderating effect of Cayuga Lake along the Eastern side of the area necessitating a cut-off at Paines Creek.

A second characteristic of great wine growing regions is their micro-climate. The micro-climate of the proposed viticultural area is created by Cayuga Lake. At 382 feet above sea level, Cayuga Lake is the lowest of the Finger Lakes.

Because of the breadth (4.2 miles maximum) and depth (431 feet maximum) of Cayuga Lake in the proposed viticultural area, the lake remains unfrozen throughout the winter and thus not only moderates the winter climate but also produces frost protection in the Spring and Fall.

The time from the last Spring frost to the first fall frost (growing season), averages 163 days in much of the Finger Lakes.

The Cayuga Lake micro-climate adds days to the season with its temperature moderating effect, but only where air drainage down the slopes to the lake is not interrupted by variations in the sloping terrain and where the elevation does not cancel the temperature moderating effect.

Soil type boundries and micro-climate boundries are very similar on the West side of Cayuga Lake. On the East side, however, micro-climate boundries (elevation and terrain irregularities) predominately determine the boundries of the proposed Cayuga Lake viticultural region.

NARRATIVE DESCRIPTION OF THE BOUNDRIES FROM USGA MAPS

West shore Cayuga Lake

Start from a point where the Town Line Road, dividing the townships of Fayette and Varick in Seneca County, intersects with State Highway Route 89 and Cayuga Lake. Proceed West on Town Line Road, 2.7 miles to State Route 414. South on State Route 414, 3.0 miles to County Road 128 (Ernsberger Road). East on County Road 128, 1.2 miles to McDuffy Town Road. South on McDuffy Town Road (County Road 129), 5.7 miles to State Road 96. South on State Road 96, 9.7 miles to Lower Covert Road. South on Lower Covert Road, 1.4 miles to Congress-Extension Road. South on Congress-Extension Road, .09 miles to the Town Line Road dividing Seneca County From Tompkins County. East 1.0 miles on Town Line Road to Frontenac Road. East 1.1 miles on Frontenac Road to the intersection of Cayuga Lake and Trumansburg Creek.

East shore Cayuga Lake

Start intersection of Salmon Creek and Cayuga Lake (Myers Point). Proceed Northeast, upstream, approximately .5 miles to State Highway 34B. West on Highway 34B, 4.9 miles to Lake Road. Northwest on Lake Road, 4.1 miles to State Route 90. Northwest on State Route 90, 6 miles to mouth of Paines Creek (Intersection with Cayuga Lake).

LETTERS OF SUPPORT

Cayuga Wine Trail
RD#2, Box 273
Ovid, New York 14521
February 27, 1986

Director
Bureau of Alcohol, Tobacco and Firearms
Washington, DC 20226

Dear Sir,

We have reviewed the proposed Viticultural Area Petition for Cayuga Lake from both a viticultural and an enological perspective.

We do concur with the criteria and substantiating evidence and therefore do support the proposal as submitted by Douglas and Susanna Knapp and Robert Plane.

Supporting Organization	Principal
Americana Vineyards	Mary Anne Tuttle
Fleur Du Bois	[illegible]
Knapp Vineyards	Douglas Knapp
Lakeshore Winery	Doris B. Brown
Lucas Vineyards	Ruth M. Lucas
Hosmer	Cameron C Hosmer
Plane's Cayuga Vineyard	Robert A Plane
Swedish Hill Vineyard	Richard E Peterson
Frontenac Vineyards	James Doolittle

COOPERATIVE EXTENSION

Cornell University
State University of New York
U.S. Department of Agriculture

Cooperative Extension Association
of Seneca County
Mill & William Sts., Waterloo, NY 13165

Agriculture
315-539-9252

Home Economics
315-539-9254

4-H
315-539-9251

February 28, 1986

Director
Bureau of Alcohol, Tobacco and Firearms
Washington, D. C. 20000

Dear Sir:

A group of local wineries are in the process of applying for a Cayuga Lake Appelation of Orgin.

I have been a Cooperative Extension Agent in this county for 29 years and have observed several facts that are significant and specific to this area. The two facts are:

1. In the 29 years none of these vineyards have had significant damage from late spring frosts or early fall frosts.

2. The variety Delaware, which is grown throughout the Finger Lakes area has consistently had higher sugar content from this particular area than from other grape areas in the Finger Lakes.

The macro climate and soil factors make the area distinctively different.

I hope this will be of assistance in your evaluation.

Sincerely,

William H Brown

William H. Brown
Cooperative Extension Agent

WHB:mf

AMMENDED PETITION FOR APPELLATION OF ORIGIN DESIGNATION "CAYUGA LAKE"

Submitted by:
Douglas and Susanna Knapp
Robert Plane

Ammended:
March 26, 1987
Knapp Frams Inc.
2770 Co. Rd. 128
Romulus, NY 14541
315-549-8865
607-869-9217

The preparers of this petition request that the area of land surrounding and directly adjacent to Cayuga Lake, as found in the counties of Seneca, Tompkins, and Cayuga in the state of New York, be considered for an appellation of origin designation to be called "Cayuga Lake".

The body of water called Cayuga Lake received its name from the Cayuga Indians of New York state. The name also figures prominately in identifying, as opposed to Seneca, Canandaigua, and Keuka, the area in the diaries of General Sullivan during his campaign to open upstate New York land to settlers. Cayuga Lake is the name used by the first permenant settlers in Seneca County in 1789 and has remained the same to the present time. The large State Park on the northern west shore of the lake is named Cayuga Lake State Park, the varient Cayuga Lake Boulevard is used for State Route 89, and Cornell University of Ithaca, New York, begins its anthem with the words, "High above Cayuga's waters...". There is no other name that can be applied to the specific area described in this proposal.

The eight commercial wineries within the proposed Cayuga Lake area recognize that they would benefit by this appellation in their marketing efforts. The wine consumer would benefit by beign to more easily identify wines coming from the Cayuga Lake area.

The proposed viticultural area, Cayuga Lake, lies within an already certified appellation of origin, the Finger Lakes, and is established as an area suitable for wine grape growing (see Appellation Finger Lakes description and Soil Survey reference material). The boundries of the proposed Cayuga Lake viticultural area have been specifically identified on USGA survey map titled "Elmira" and numbered NK 18-4. These boundries have been physically located and evaluated on a field check by the applicants. It is the petitioners intent to further define and delineate this area within an area as having grape growing and wine making properties distinctly different than and separate from the larger Finger Lakes viticultural area.

It has long been know that the primary factors determining grape and wine quality, as exemplified in the great wine growing regions of Euope, Burgundy, Bordeaux, and the Rheingau, are soil type and micro-climate.

In defining the proposed viticultural region of Cayuga Lake, two criteria are used. One, soils must be high lime, glacial till and two, the maximum elevation may be no more than 800 feet above the surface of Cayuga Lake. This second criterion contains two parts which further delineate the land on the East and West slopes of Cayuga Lake; a) topography and b) micro-climatic effects.

The Cayuga Lake basin is one of two major land formations in the Finger Lakes that resulted from glacier activity in the Pleistocene epoch. As consistantly stated in O. D. von Engeln's The Finger Lakes Region: Its Origin and Nature, The Cayuga Lake basin is separated from the second major basin, Seneca, by both topography and soil type.

In all of the aforementioned European wine regions, the high lime soils have provided grapes of maximum flavor intensity and Ph and acid levels appropriate for optimum wine quality.

In the proposed Cayuga Lake viticultural region, the soils developed in glacial till are dominated by high lime and high Ph (6.5-7.5) and have unique drainage properties. They are deep, well drained to moderately well drained soils, and have a heavy silt loam to heavy loam subsoil. (See following supporting evidence.)

1) General Soil Map of New York State as found in Soils of New York Landscapes by M. G. Cline and R. L. Marshall.

2) Seneca County Soil Survey-USDA, 1972.

3) Cayuga County Soil Survey-USDA, 1971.

4) Tompkins County Soil Survey-USDA, 1965.

5) The Finger Lakes Region: Its Origin and Nature, by O. D. von Engeln.

6) Roadside Geology of New York, "Cayuga Wine Trail", Bradford Van Diver; Mountain Press Publications, Missoula, 1985, pp.217-225.

7) Geographical Review, Vines, Wines, and Regional Identity in the Finger Lakes Region", James L. Newman; Vol. 76, #3, July 1986; pp.301-316.

8) "Temperature Near a Narrow, Deep Lake in Central New York State with Applications for Cold-Sensitive Crops", Thomas W. Schmidlin and Bernard E. Dethier, Atmospheric Sciences Unit, Agronomy Department, Cornell University, 1983.

On the Western slope of Cayuga Lake, the Honeoye-Lima association soils clearly separate the North/South narrow strip of land from the surrounding soils. It is bordered on the North by Odessa-Schoharie-and Fulton Lucas associations (medium to fine textured soils on glacial lake or marine sediment), on the Northwest by Darien-Romulus-and Mahoning-Trumbull associations (deep to moderately deep somewhat poorly and poorly drained soils), and to the South/Southwest by Lansing-Conesus association (dominately deep well-and moderately well-drained low lime soils on glacial till).

The topography separating Cayuga Lake Basin and Seneca Lake Basin from the town of Fayette south to the town of Ovid, consists of low, poorly drained pockets of soil. From the town of Ovid south, and to the West, increasing elevations rise well above the temperature moderating effects of Cayuga and Seneca Lakes.

On the Eastern shore of Cayuga Lake, the same soil group (Honeoye-Lima association) begins at the southern end of the proposed viticultural area at Ithaca and extends northward to Aurora, New York .

Topography, however, limits the micro-climatic impact of Cayuga Lake. Higher elevations or irregular terraine interrupts the moderating effect of Cayuga Lake along the Eastern side of the area necessitating a narrowing of the viticultural region from Paines Creek to the north end of Cayuga Lake.

A second characteristic of great wine growing regions is their micro-climate. The micro-climate of the proposed viticultural area is created by Cayuga Lake. At 382 feet above sea level, Cayuga Lake is the lowest of the Finger Lakes.

Because of the breadth (4.2 miles maximum) and depth (431 feet maximum) of Cayuga Lake in the proposed viticultural area, the lake, with the exception of the northern and southern tips, remains unfrozen throughout the winter. Thus it not only moderates the winter climate but also produces frost protection in the Spring and Fall.

The time from the last Spring frost to the first fall frost (growing season), averages 163 days in much of the Finger Lakes.

Soil type boundries and micro-climate boundries are practically congruent on the West side of Cayuga Lake. On the East side, however, micro-climate boundries (elevation and terrain irregularities) predominately determine the boundries of the proposed Cayuga Lake viticultural region.

The Cayuga Lake micro-climate adds days to the season with its temperature moderating effect, but only where air drainage down the slopes to the lake is not interrupted by variations in the sloping terrain and where the elevation does not cancel the temperature moderating effect.

NARRATIVE DESCRIPTION OF THE BOUNDRIES FROM USGS MAP TITLED "ELMIRA", AND NUMBERED "NK 18-4".

Start from a point in the north corner of the proposed appellation where Route 90 intersects Routes 5 and 20. Proceed south on Route 90 to the point at Lake Ridge where 90 intersects with Route 34 B. South on 34B to the point in Lansing where 34B intersects with Route 34. South on Route 34 to the point where 34 intersects with Route 13. South on Route 13 to where Route 13, in Ithaca, intersects with Route 79. West on Route 79 to where Route 79 intersects with Route 96. North on Route 96 to where Route 96 intersects with Route 414. North on Route 414 to where Route 414 intersects with Routes 5 and 20 in the town of Seneca Falls. East on Routes 5 and 20 to where Routes 5 and 20 intersect with Route 90.

APPELLATION OF ORIGIN DESIGNATION " CAYUGA LAKE"

The total area of the proposed Appellation of Origin Cayuga Lake is approximately 240 square miles.

The land portion of the proposed Appellation of Origin Cayuga Lake is approximately 144 square miles.

VINEYARDS AND NUMBER OF ACRES IN THE PROPOSED APPELLATION OF ORIGIN "CAYUGA LAKE"

VINEYARDS	ACRES
Garnsey	10
Backlund (Aurora Dawn)	50
Mayer (Red Creek)	70
Brown (Lakeshore)	10
Peterson (Swedish Hill)	30
Souhan (Cobblestone)	35
Williams	30
Mass	6
Knapp, Douglas (Knapp)	65
Knapp, James	4
Jennings	4
Plane (Plane's Cayuga Vineyards)	40
Hosmer (Hosmer)	40
Lucas (Lucas Vineyards)	21
Treble (Americana)	10
Doolittle (Frontenac)	24
Culver	4
Dumas	7
	460

Vineyards near proposed Appellation of Origin Cayuga Lake

Battistella	4

Bob Pool

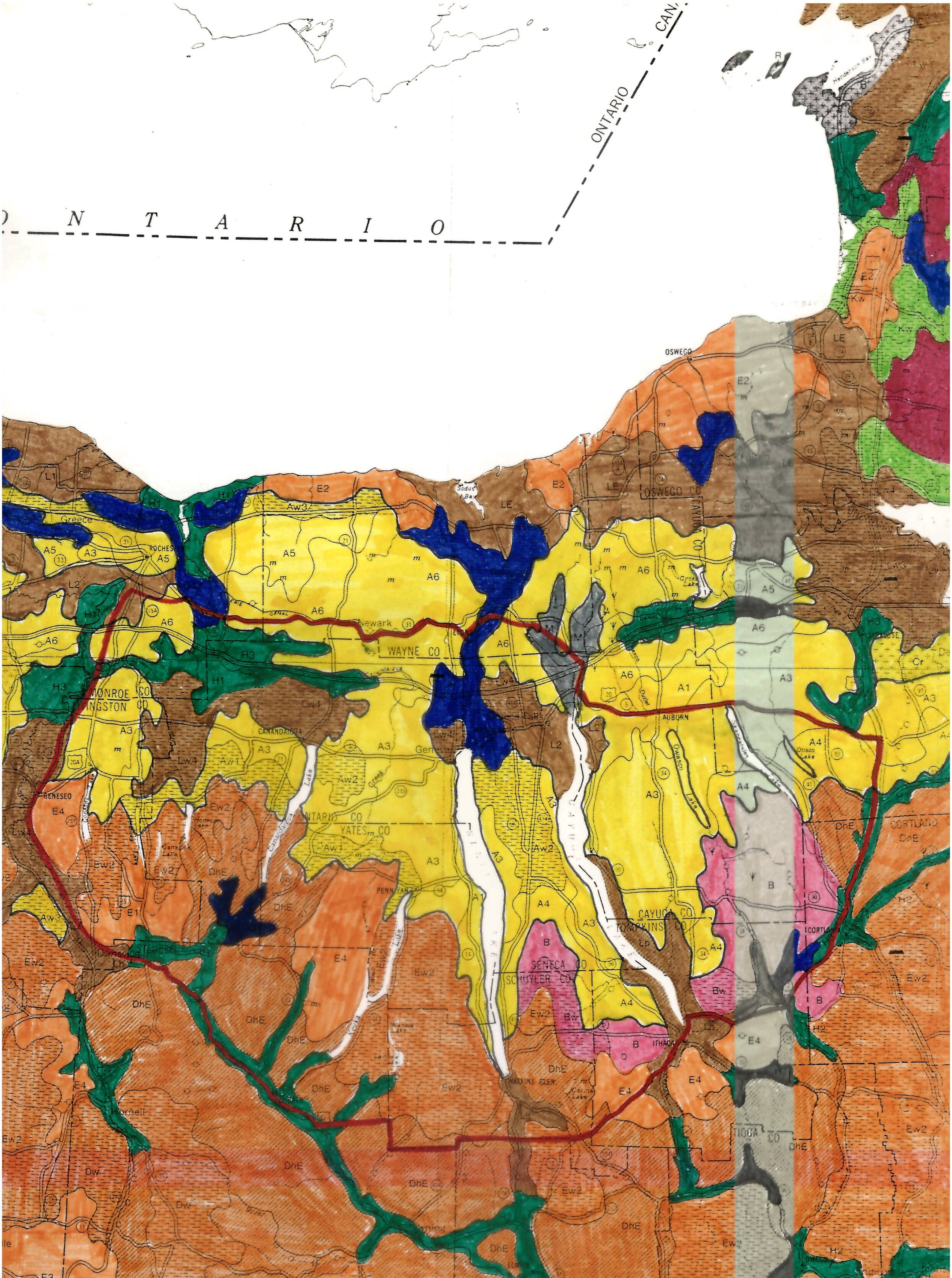
Physical Sciences • Agronomy 6

INFORMATION BULLETIN 119 • $2.00

Soils of New York Landscapes

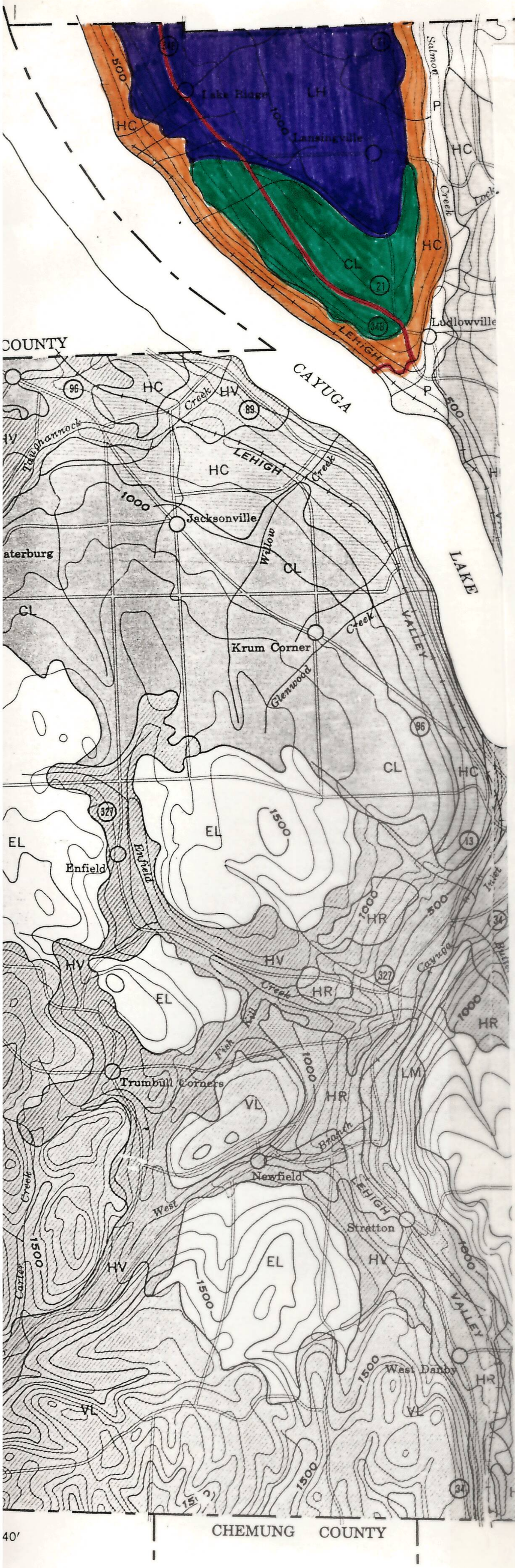
M. G. Cline and R. L. Marshall

AN EXTENSION PUBLICATION OF THE NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES, A STATUTORY COLLEGE OF THE STATE UNIVERSITY, AT CORNELL UNIVERSITY, ITHACA, NEW YORK



Finger Lakes Vit. Area in Red

LIMITATION LEGEND



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CORNELL UNIVERSITY
AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
TOMPKINS COUNTY, NEW YORK

Proposed Vit. Area Boundary Line

SOIL ASSOCIATIONS

ASSOCIATIONS DOMINATED BY HIGH-LIME SOILS

Developed on Glacial Till

LH — Lima-Honeoye: Dominantly moderately well drained, silty soils on gently rolling to moderately steep topography

Developed on Glacial Till and Lake-Laid Material

HC — Hudson-Cayuga: Dominantly moderately well drained, heavy-textured soils on moderate to steep slopes

Developed on Lake-Laid Material

HR — Hudson-Rhinebeck: Moderately well drained and somewhat poorly drained, heavy-textured soils generally free of stones and gravel

Developed on Glacial Outwash

P — Palmyra: Well-drained, light-textured soils on stratified sand and gravel

ASSOCIATIONS DOMINATED BY MEDIUM-LIME SOILS

Developed on Glacial Till

CL — Conesus-Lansing: Moderately well drained and well drained, medium-textured soils on gently rolling topography

Developed on Glacial Outwash and Till

HV — Howard-Valois: Mainly well-drained, light-textured and medium-textured, gravelly soils on level, rolling, or steep topography

ASSOCIATIONS DOMINATED BY LOW-LIME SOILS WITH A STRONG FRAGIPAN

Developed on Glacial Till

LE — Langford-Erie: Moderately well drained and somewhat poorly drained, medium-textured soils on rolling to moderately steep topography

EL — Erie-Langford: Dominantly somewhat poorly drained, silty soils on mild topography

ASSOCIATIONS DOMINATED BY VERY LOW-LIME SOILS WITH A STRONG FRAGIPAN

Developed on Glacial Till

VL — Volusia-Lordstown: Somewhat poorly drained and well-drained soils on rolling to steep topography

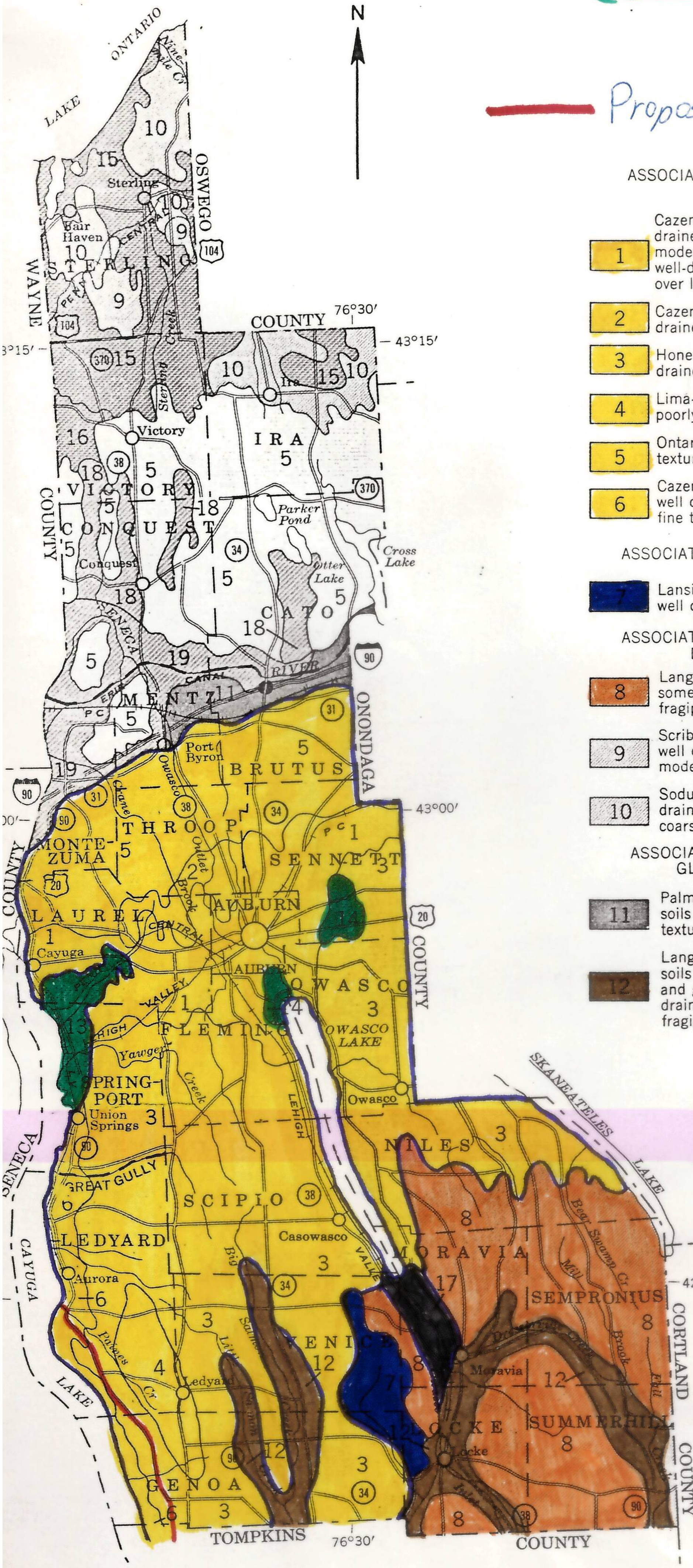
LM — Lordstown-Mardin: Well drained and moderately well drained, shallow and deep soils on rolling to steep topography

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

GENERAL SOIL MAP
CAYUGA COUNTY, NEW YORK

Scale 1:31 680

1 0 1 2 3 4 5 Miles



—— *Proposed Vit. Area Boundary Line*

SOIL ASSOCIATIONS

ASSOCIATIONS DOMINATED BY HIGH-LIME SOILS DEVELOPED ON GLACIAL TILL

- **1** Cazenovia-Ovid-Ontario, moderately shallow: Deep, well-drained to somewhat poorly drained soils that have a moderately fine textured subsoil, and moderately shallow, well-drained soils that have a medium-textured subsoil over limestone bedrock
- **2** Cazenovia-Ovid: Deep, well-drained to somewhat poorly drained soils that have a moderately fine textured subsoil
- **3** Honeoye-Lima: Deep, well drained and moderately well drained soils that have a medium-textured subsoil
- **4** Lima-Kendaia: Deep, moderately well-drained and somewhat poorly drained soils that have a medium-textured subsoil
- **5** Ontario: Deep, well-drained soils that have a medium-textured to moderately coarse textured subsoil
- **6** Cazenovia-Aurora: Deep and moderately deep, moderately well drained or well drained soils that have a moderately fine textured subsoil

ASSOCIATIONS DOMINATED BY MEDIUM-LIME SOILS DEVELOPED ON GLACIAL TILL

- **7** Lansing-Conesus: Deep, well drained and moderately well drained soils that have a medium-textured subsoil

ASSOCIATIONS DOMINATED BY LOW-LIME SOILS DEVELOPED ON GLACIAL TILL

- **8** Langford-Erie: Deep, moderately well drained and somewhat poorly drained soils that have a medium-textured fragipan
- **9** Scriba-Ira: Deep, somewhat poorly drained ~~and moderately well drained~~ soils that have a medium-textured to moderately coarse textured fragipan
- **10** Sodus-Ira: Deep, well drained and moderately well drained soils that have a medium-textured to moderately coarse textured fragipan

ASSOCIATIONS DOMINATED BY SOILS DEVELOPED ON GLACIAL OUTWASH TERRACES AND KAMES

- **11** Palmyra-Wampsville: Deep, well-drained, high-lime soils that have a medium-textured or moderately fine textured subsoil over sand and gravel
- **12** Langford-Howard: Deep, well-drained, medium-lime soils that have a medium-textured subsoil over sand and gravel, and deep, moderately well drained or well drained, low-lime soils that have a medium-textured fragipan

ASSOCIATIONS DOMINATED BY SOILS DEVELOPED GLACIAL LAKE SEDIMENTS

- **13** Schoharie-Odessa: Deep, well-drained to somewhat drained, high-lime soils that have a fine-textured sub
- **14** Arkport-Colonie: Deep, well-drained to excessively drained, medium-lime and low-lime soils that have a moderately coarse textured or coarse textured subsoi over sand
- **15** Williamson-Ira: Deep, moderately well drained, low-l soils that have a medium-textured to moderately coa textured fragipan
- **16** Colonie-Alton: Deep, well-drained, low-lime soils tha a coarse textured subsoil over sand or a moderately textured subsoil over sand and gravel

ASSOCIATIONS DOMINATED BY SOILS DEVELOPED FLOOD PLAINS

- **17** Sloan-Eel: Deep, very poorly drained to moderately well drained, medium-lime to high-lime soils that have a medium-textured subsoil

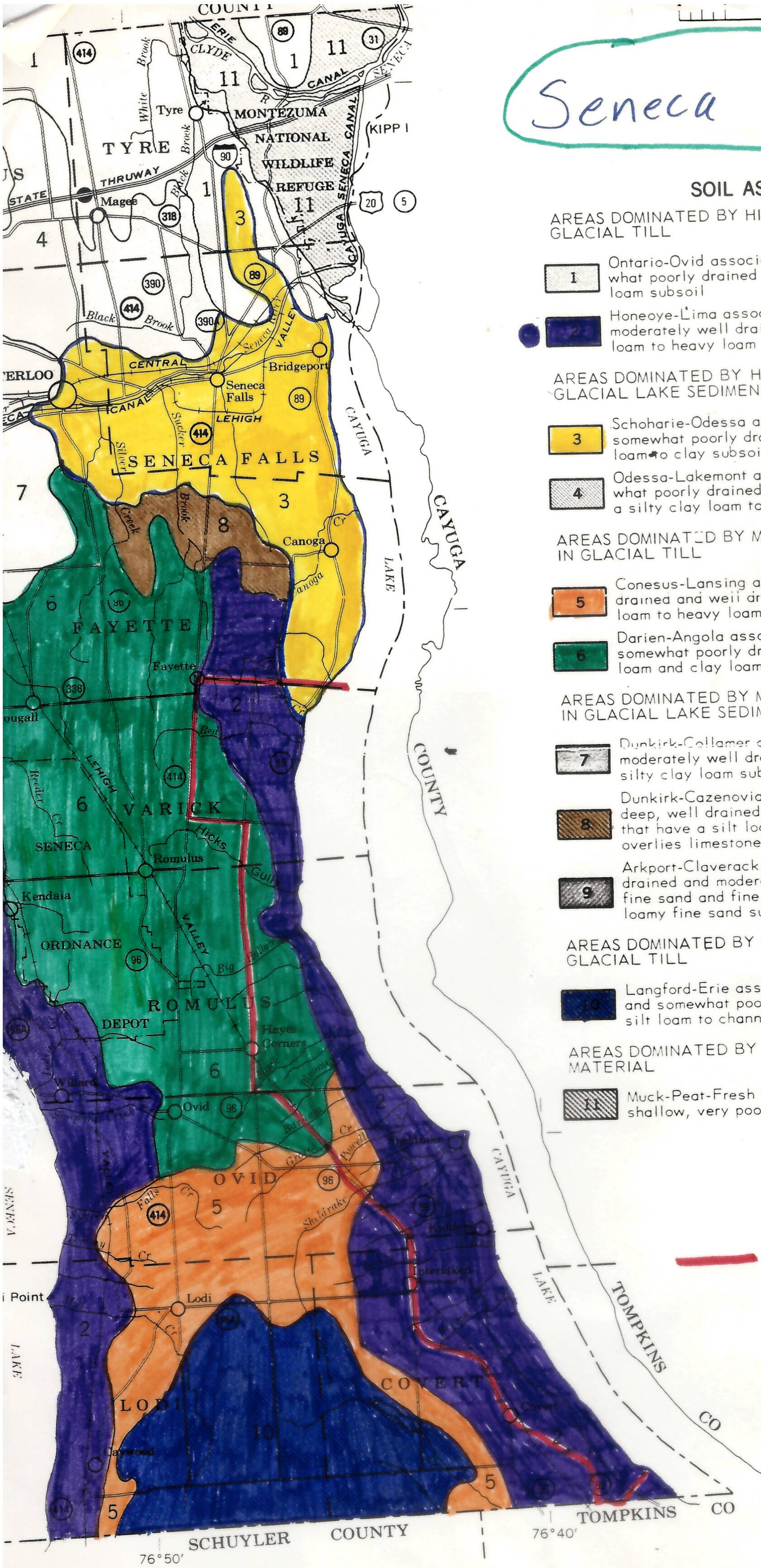
ASSOCIATIONS DOMINATED BY SOILS DEVELOPED ORGANIC MATERIAL

- **18** Muck: Deep to shallow, very poorly drained organic
- **19** Muck-Warners: Deep to shallow, very poorly drained organic soils, and very poorly drained to moderately well drained soils that developed in alluvium over ma

April 1970

NOTE—
This map is intended for general planning. Each delineation may contain soils having rat-

Seneca County



SOIL ASSOCIATIONS

AREAS DOMINATED BY HIGH-LIME SOILS DEVELOPED IN GLACIAL TILL

1 — Ontario-Ovid association: Deep, well-drained to somewhat poorly drained soils that have a loam to silty clay loam subsoil

2 — Honeoye-Lima association: Deep, well drained and moderately well drained soils that have a heavy silt loam to heavy loam subsoil

AREAS DOMINATED BY HIGH-LIME SOILS DEVELOPED IN GLACIAL LAKE SEDIMENTS

3 — Schoharie-Odessa association: Deep, well-drained to somewhat poorly drained soils that have a silty clay loam to clay subsoil

4 — Odessa-Lakemont association: Deep, dominantly somewhat poorly drained and poorly drained soils that have a silty clay loam to silty clay subsoil

AREAS DOMINATED BY MEDIUM-LIME SOILS DEVELOPED IN GLACIAL TILL

5 — Conesus-Lansing association: Deep, moderately well drained and well drained soils that have a heavy silt loam to heavy loam subsoil

6 — Darien-Angola association: Deep and moderately deep, somewhat poorly drained soils that have a silty clay loam and clay loam subsoil

AREAS DOMINATED BY MEDIUM-LIME SOILS DEVELOPED IN GLACIAL LAKE SEDIMENTS

7 — Dunkirk-Collamer association: Deep, well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil

8 — Dunkirk-Cazenovia association: Moderately deep and deep, well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil that overlies limestone

9 — Arkport-Claverack association: Deep, dominantly well drained and moderately well drained soils that are loamy fine sand and fine sandy loam throughout or that have a loamy fine sand subsoil over silty clay or clay

AREAS DOMINATED BY LOW-LIME SOILS DEVELOPED IN GLACIAL TILL

10 — Langford-Erie association: Deep, moderately well drained and somewhat poorly drained soils that have a channery silt loam to channery loam fragipan

AREAS DOMINATED BY SOILS DEVELOPED IN ORGANIC MATERIAL

11 — Muck-Peat-Fresh Water Marsh association: Deep to shallow, very poorly drained organic soils

February 1971

— proposed boundary line

NOTE—
This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning.

Roadside Geology of N.Y
Bradford B. Van Diver

Mountain Press Publishing Company
Missoula 1985

(89)

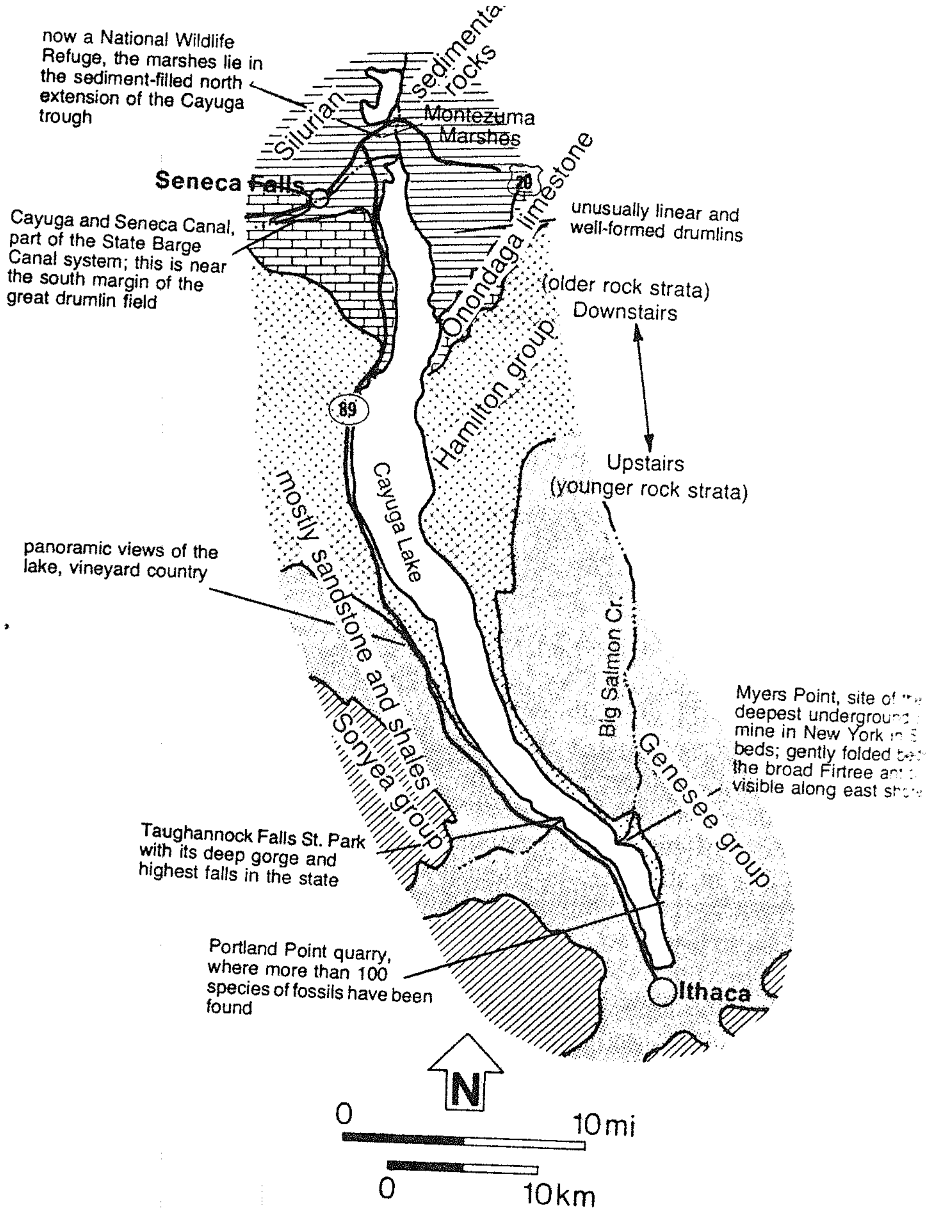
NY 89:
US 20—Ithaca
41 mi./66 km.

THE CAYUGA WINE TRAIL

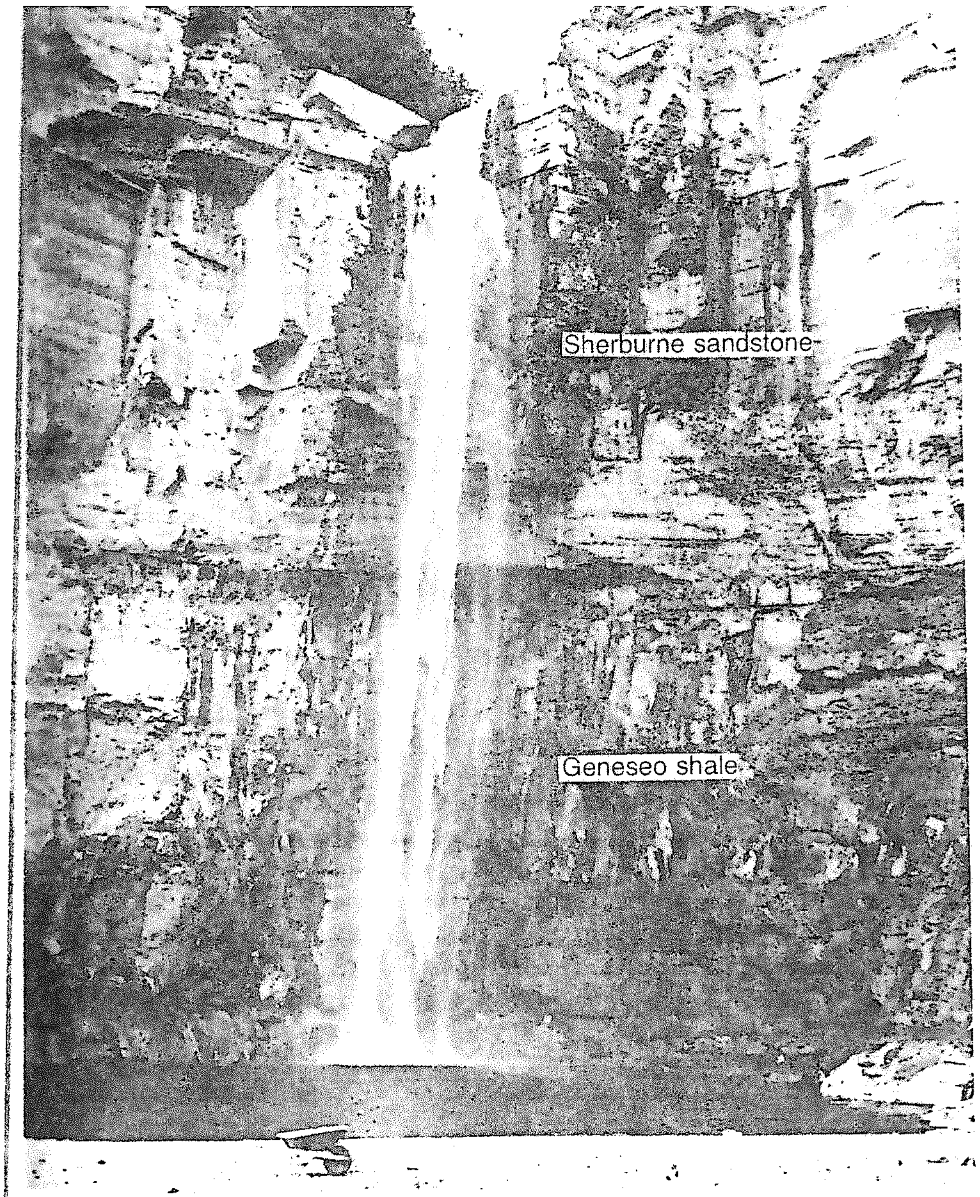
This scenic highway follows the west side of Cayuga Lake from its junction with US 20 by the Montezuma Marshes at the northern end to Ithaca at the southern end. The marshes, which are now under federal protection as the Montezuma National Wildlife Refuge, lie in the sediment-filled northern extension of the Cayuga trough. This is the only one of the Finger Lakes troughs that extends northward beyond the Allegheny Plateau, and geologists are still uncertain as to why it does so (see discussion in US 20: Canandaigua—La Fayette). The Erie Canal and the Cayuga and Seneca Canal pass through this swamp, and the New York Thruway and US 20 cross over it.

The highway crosses the Cayuga and Seneca Canal just south of the US 20 junction, and right about at the southern margin of the drumlin field. The canal is the much-channelized and deepened Seneca Lake outlet that permits barge and pleasure boat traffic between the two lakes, and connects with the Barge Canal at the north end of the marshes. The drumlin field extends a little farther south on the east side of the lake, where the drumlins are strikingly linear and unusually well-formed.

The slopes descending to the lake throughout are dotted with vineyards where some of the East's finest wines are vinted. A key factor that makes this region so well suited for growing grapes is the



NY 89
US 20—ITHACA



Taughannock Falls, highest in the state; key formations labeled, all belong in the Genesee group.

shaley bedrock, which breaks up into small chips that form a boxwork in the soil. This provides a lot of passageways so the soil is well-drained. The slope angle is also important in draining the soil. Very few of the vineyards are perched on the flat crest of the intertrough divide; most are nearer the lake where the incline is just right. There appears to be none on the steepest slopes at lakeside.

Between the Montezuma Marshes and Taughannock Falls State Park (32 miles), the road lies partly along the shore and partly high upon the slope where you have spectacular, panoramic views over the lake. En route, you cross numerous gullies cut in the trough wall by small, postglacial creeks. Taughannock Creek is a much larger stream that has sliced a lovely canyon with Taughannock Falls at its head. Taughannock Falls are 215 feet high, the highest in the state. Taughannock Point is a modern, fan-shaped delta in the lake built of sediments derived from the cutting of the gorge. The strata exposed in the walls of the gorge are slightly older than those of Buttermilk Glen or Enfield Glen south of Ithaca. This is because the regional dip, or slope, of the beds is slightly southward; along a certain horizon such as the lake level, the beds get older toward the north as you move "down" in the stratigraphic section.

At the entrance to the gorge, there is a small falls sustained by Tully limestone, which is sandwiched between the weaker shales of the Genesee group above and the Hamilton group below. The main falls are about one mile into the gorge and may be reached by an easy trail. Over most of the way the streambed is the broad, flat surface of the Tully, swept clean of the overlying shales by floodwaters. The surface is criss-crossed with joints and pocked with small solution pits. The walls heighten progressively into the gorge, reaching a maximum of 400 feet in the amphitheater of the main falls. The falls are held up by the moderately resistant Sherburne siltstone of the Genesee group, overlying the upper 90 feet of black Geneseo shales. One hundred fifty feet of block jointed Sherburne is capped by 50 feet of Ithaca shales beginning about 25 feet above the falls. The carving of the great amphitheater is mostly due to the action of spray in accelerating rock weathering and erosion. Also the gorge is probably lengthening more slowly since the harder Sherburne beds were intercepted, giving more time for hollowing of the amphitheater. In the early stages, the top of the gorge was below the base of the Sherburne, and there were probably steep rapids in place of falls. It was only recently, geologically speaking, that the Sherburne was intersected and the cataract initiated. The falls recession is slow by human standards, but geologically very rapid. The last major recorded rockfall from the lip of the falls occurred between 1888 and 1892!

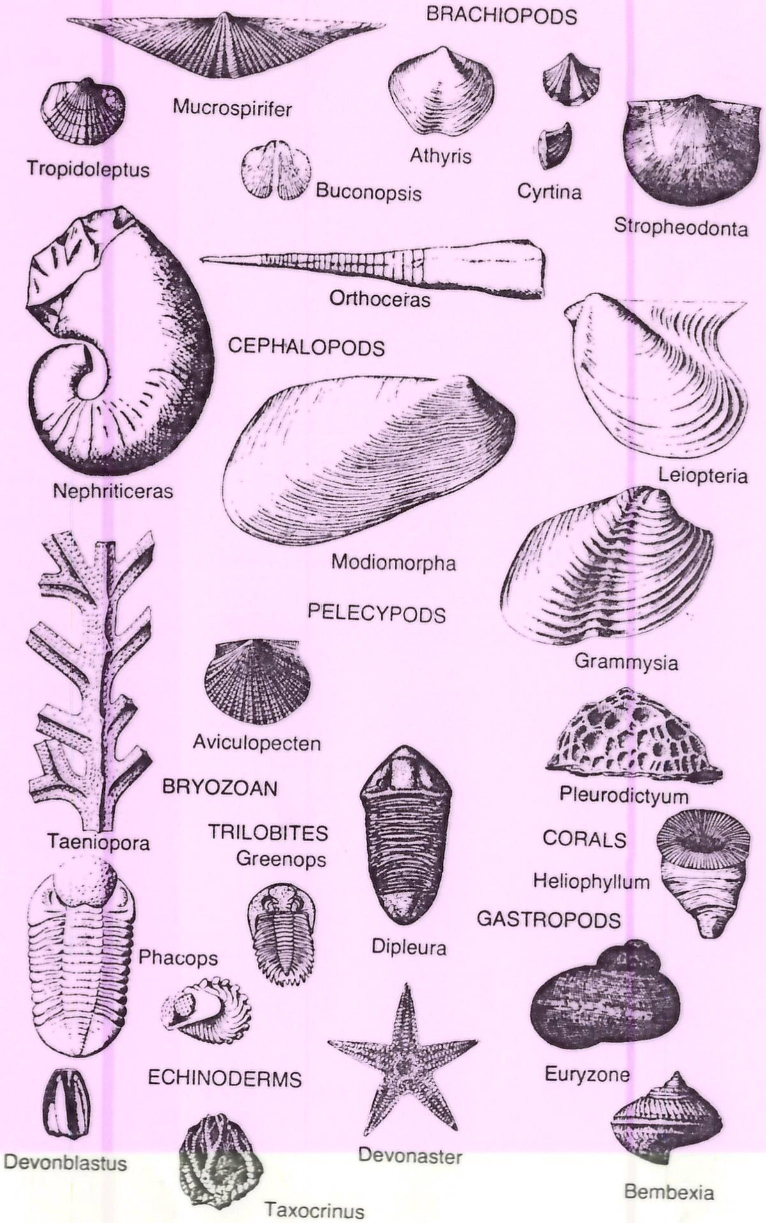
On the southern part of the route between Taughannock State Park and Ithaca (9 miles), you have good views of Myers Point on the opposite shore, the modern lake delta of Salmon Creek, which forms one of the best-known barbed junctions in the eastern Finger Lakes (see discussion of barbed junctions and stream piracy in NY 17: Harriman—Binghamton). The preglacial Salmon Creek drained southward over the plateau; but it was eventually captured by the dominant north-flowing Cayuga River, whose widened and deepened valley now contains the lake. The present Salmon River course approximates the preglacial one, preserving the fossil barbed junction.

Myers Point is presently the site of the largest underground salt mine in the Finger Lakes region. Salt is closely assciated with gypsum beds in the late Silurian Salina group. Over 10,000 square miles of western and central New York are underlain by Silurian rock salt; and its extraction has been an important part of New York's economy for a long time. Salt springs near Onondaga Lake were known to the Indians; and trading for salt, evaporated from these springs, is largely responsible for the location of the city of Syracuse.

The salt and gypsum are "evaporite" deposits formed in a Dead Sea or Great Salt Lake type of environment which typified much of the late Silurian period in New York and Michigan. Under these conditions, seawater, or even so-called "fresh" water, is evaporated from shallow basins until their dissolved salts become so concentrated that they precipitate. With just the right balance between evaporation rate and rate of influx of new water, the critical concentration can be maintained for long periods, and thick deposits of only one kind of salt accumulate. At other levels of concentration other salts like gypsum would precipitate. One of the most awesome occupants of these very salty Silurian seas were the eurypterids, otherwise called sea scorpions, an ancestor of the modern king crab that sometimes grew to 9 feet long! The Bertie formation limestones of New York are well known for their abundant, well-preserved fossils of these bizarre arthropods.

The salt beds under Myers Point, along with the overlying and underlying strata, have been upfolded into the broad, gentle Firtree Point anticline, which can be seen along the shore south of the point. The anticline has ' een drilled to the early Devonian Oriskany sandstone in search of gas, but the amount found was too small to be marketable. The Oriskany is a major producer in other parts of the state.

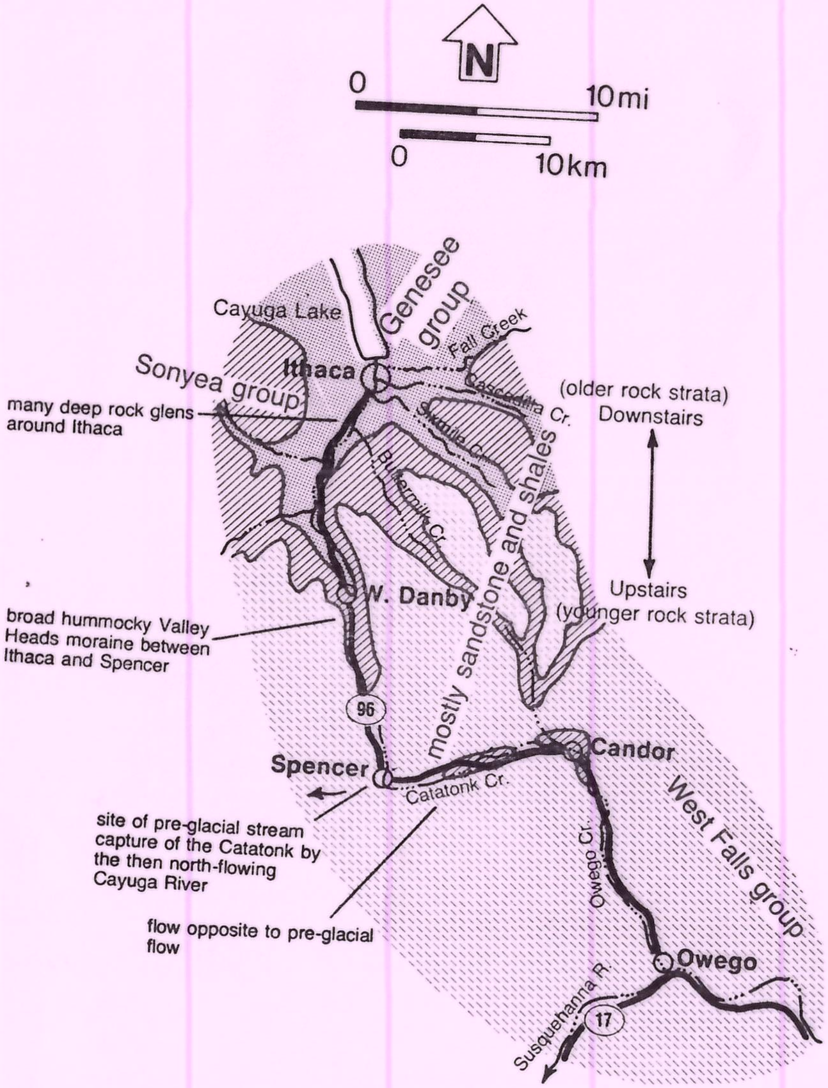
The Portland Point quarry, a mile southeast of Myers Point, is a famous fossil locality, where over 100 species of corals, bryozoa, crinoids, brachiopods, pelecypods, gastropods, and cephalopods have been found. The overlying Tully limestone has been taken for cement manufacture, riprap, and road stone.



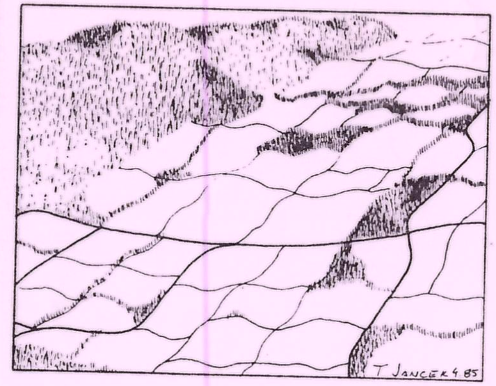
Representative fossils of the Hamilton group of New York, all at about half scale. Courtesy Kendall/ Hunt Publishing Co.

Near Ithaca, the highway descends to the flat delta plain of the south end of the lake, on which much of the city is built (see NY 13: Cortland—Horseheads discussion).

Septarian concretion in Geneseo (Genesee group) black shales of the Hubbard quarry, 9 miles north of Toughannock Point on NY 89.
Courtesy Kendall / Hunt Publishing Co.



NY 96
ITHACA—OWEGO



Sketch of an aerial view looking south over the hummocky topography of Valley Heads moraine between Ithaca and Spencer. NY 96B is the dark line on the right.
Drawing by T. Jancek

NY 96: Ithaca—Owego
38 mi./72 km.

Between Ithaca and Spencer (19 miles), this route crosses over the most remarkable expanse of glacial moraine in New York, the part of the Valley Heads moraine that blocks the southern reach of the Cayuga Lake trough. No other segment of the Valley Heads is as extensive as this one, and none displays the characteristic boulder-strewn, mounded and pitted, kettle-pocked topography as well.

At its highest point a few miles north of Spencer, the moraine is over 1000 feet above sea level, over 600 feet higher than the 389 foot level of the present lake. You can see that this is a pretty effective dam.

The moraine grades to pitted outwash plain between West Danby and Spencer (8 miles), with a lot of marshy hollows, small kettle lakes, and one large one. Kame terraces are also well developed on the sides of the trough in this stretch.

The north-south Cayuga trough meets with the east-west Candor-Van Etten Valley at Spencer in a peculiar T-junction that requires some explanation. Apparently, the preglacial east-west valley was carved along the scarp of the Gardeau formation of the late Devonian West Falls group that now crops out on the hilltops to the south. There are many lesser scarps like this in the Allegheny Plateau region where more resistant beds form caprocks and most go east-west because the beds dip southward. Fall Creek valley near

You might find this useful. TWS.

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6.8

TEMPERATURE NEAR A NARROW, DEEP LAKE IN CENTRAL NEW YORK STATE WITH APPLICATIONS FOR COLD-SENSITIVE CROPS

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1. INTRODUCTION

The Finger Lakes region of central New York has developed into the major wine grape production area of the eastern United States. Sixteen thousand acres are planted to grapes and annual grape production value at the vineyards is about $16 million. The Finger Lakes are a group of 11 lakes which are roughly parallel with their major axes running north-south. They are at the southern margin of the Lake Ontario drainage basin at the edge of the Appalachian Highlands. The northern ends of the lakes are shallow and bounded by relatively flat terrain about 45 km from Lake Ontario. The southern ends of the lakes are deep and bounded by hills 300-400 m above the lakes. Most grapes are grown on the hillsides around the southern ends of Cayuga, Seneca, Keuka, and Canandaigua Lakes (Figure 1 and Table 1).

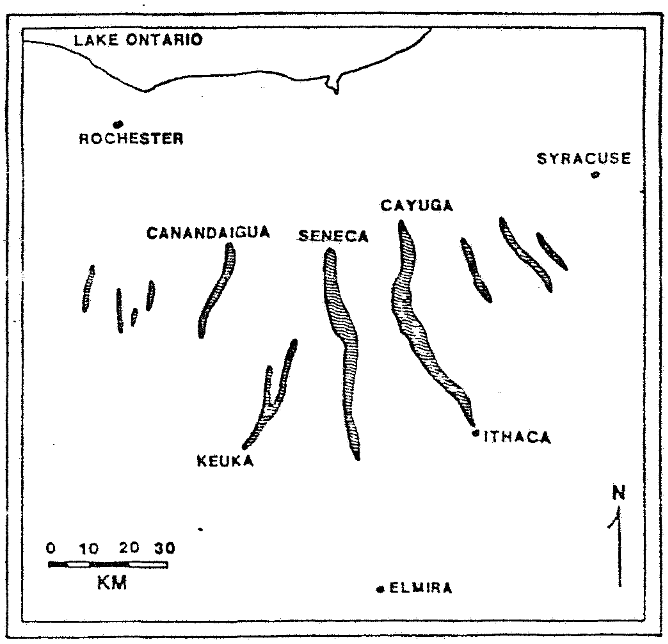

Figure 1. The Finger Lakes region, New York.

*currently at NOAA/National Climate Program Office, Rockville, MD

Table 1. Physical description of the four major lakes in the Finger Lakes grape producing region.

Lake	Length (km)	Maximum width (km)	Elevation (m)	Maximum depth (m)
Cayuga	64	5	117	133
Seneca	58	5	135	193
Keuka	35	2	216	57
Canandaigua	26	2	209	80

Climate has played a major role in the establishment and maintenance of a grape industry in the region. Grapes, especially the vitis vinifera varieties of current popularity, are vulnerable to winter and spring cold damage in this climate. Temperatures of -22°C in mid-winter will damage vines, trunks, and buds; temperatures of -26°C will cause severe damage. Damage is possible at warmer temperatures if the temperature falls rapidly and temperatures below -2°C after May 1 will damage fruit buds.

Grapes are grown successfully in the Great Lakes region near the shores of Lakes Erie and Michigan where the climatic influence of a large lake moderates extreme minimum temperatures in the cold season and delays vine growth in the spring so that tender growth stages occur when freeze risk is slight. The Finger Lakes, while much smaller than the Great Lakes, are thought to provide similar climate-moderating influences to vineyards near their shores (Mordoff, 1949; Dethier and Shaulis, 1964). The Atmospheric Sciences Unit of Cornell's Agronomy Department began a temperature study in 1961 near the southern end of Cayuga Lake to discover the extent of the lake influence on temperature.

Three questions are examined in this paper, (1) is the temperature pattern in a valley containing a lake different from that in a nearby valley without a lake, (2) is there a temperature difference between the west (upwind) and east (downwind) sides of a lake valley, and (3) if there is a lake influence on temperature, how far from the lake does the influence extend?

2. DATA COLLECTION

Three temperature transects were established in the Cayuga Valley; one each on the west and east sides of the lake about 5 km from the southern end of the lake, and one on the west side of the valley 5 km upstream (south) from the southern end of the lake (Figure 2). These transects are known as the west lake, east lake, and dry valley transects. A thermograph and maximum-minimum thermometers were placed in a standard USWB instrument shelter at elevations of 120 m, 240 m, and 305 m on each transect and at 150 m on the west lake transect. The mean lake level is 117 m. All sites were over sod except the 120 m site on the east lake transect which was over gravel and adjacent to a paved industrial complex. This site was not used in this analysis. The 120 m sites were less than 0.1 km from the lake and the 240 m sites were 1 km from the lake. The highest sites at 305 m were about 2.5 km from the lake and 5 km from the 425 m ridges which divide Cayuga Valley from the neighboring valleys on the east and west. The 150 m site on the west transect was 0.1 km from the lake.

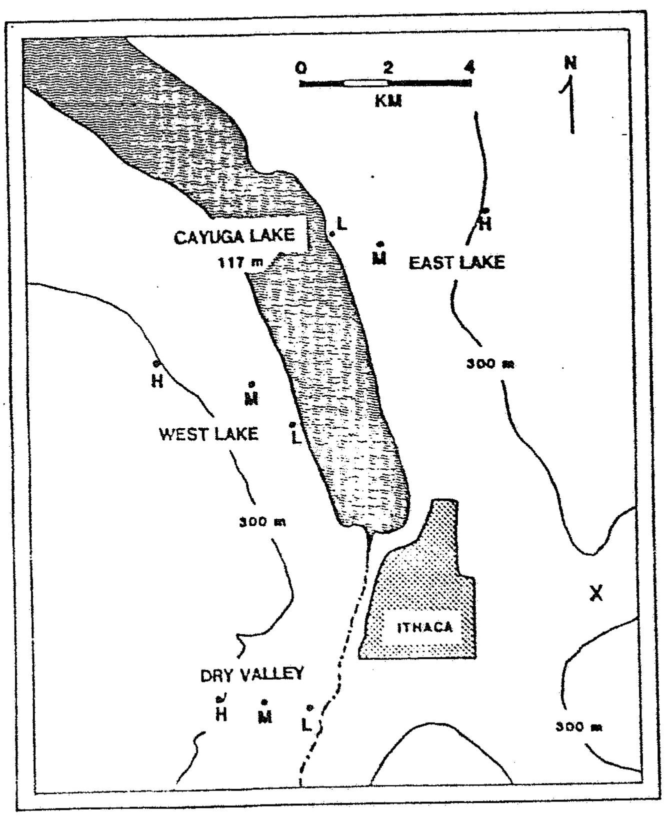

Figure 2. The southern end of Cayuga Lake where the temperature study was conducted. The 305 m, 240 m, and 120 m sites are identified by H, M, and L, for each transect. The Ithaca Cornell University weather station is shown by an 'X'.

The instrument sites were visited weekly and thermographs calibrated if any deviations were seen from the weekly extremes of the maximum and minimum thermometers. Observations were made at the dry valley transect from May 1961 through May 1963, at the west lake transect from May 1961 through August 1971, and at the east lake transect from October 1963 through August 1971. Exceptions are that the 120 m site on the west lake transect was maintained only 19 months and the 150 m site on the west lake transect was removed in January 1967. The nearest National Weather Service Cooperative Observer is Ithaca Cornell University (293 m), on a plain 5 km southeast of Cayuga Lake.

Daily maximum and minimum temperatures were read to the nearest whole degree (F) from the thermograph charts. To compare temperatures between sites, mean daily maximum and minimum temperatures were calculated for months with no missing values.

3. RESULTS

Dry Valley vs. Lake Valley

The observations made for two years on the west side of the dry valley showed the mean temperature decreased 0.7°C between the lowest and highest sites. The mean daily maximum temperature at the lowest site was 2.1°C warmer than the highest site, while the mean daily minimum was 0.8°C cooler at the lowest site. Thus, the mean daily range is 2.9°C greater at the lowest site. The minimum temperature at the middle (240 m) site was nearly the same as at the highest site and the maximum was 0.8°C warmer at the middle site. This indicates that in this particular valley the "thermal belt", or that part of the slope where night temperatures are warmer than at the valley floor, extends from below the middle site to above the highest site.

Extreme temperatures are often more important to cold-sensitive crops than mean temperatures. The data in Table 2 show that the lowest site in the dry valley is generally coldest on nights with extremely low minimum temperatures while extreme minima at the middle site are about the same as at the highest site.

Table 2. Absolute minimum temperatures (°C) on the dry valley and west lake transects and at Ithaca Cornell University.

Date	ITHACA	DRY Low	DRY Middle	DRY High	WEST LAKE Low (120m)	WEST LAKE Middle	WEST LAKE High
31 Jan 62	-18	-22	-20	-21	-18	-19	-19
11 Feb 62	-27	-26	-25	-24	-24	-25	-26
10 May 62	- 3	- 5	- 2	- 3	- 2	- 2	- 1
* 25 Oct 62	- 4	- 7	- 4	- 6	- 3	- 4	- 4
* 29 Jan 63	-27	-29	-21	-21	-22	-21	-22
16 Apr 63	- 4	- 7	- 4	- 2	- 4	- 3	- 4
3 May 63	- 2	- 4	1	0	- 2	0	2
Average of five coldest in the winter 1962-63	-25	-26	-21	-23	-22	-23	-23

A date preceded by '*' indicates a daily cold record was established at Ithaca Cornell University (1879-present).

The temperature pattern at the west lake transect was compared to the temperature pattern in the dry valley to determine whether the lake changes the temperature pattern in the valley. The same two-year period was used. The difference in mean temperature between the 150 m site and the highest site on the west lake transect was 1.4°C, twice the difference found at similar elevations in the dry valley. Daily maximum temperatures were 1.6°C warmer at the low site, similar to that found in the dry valley, but daily minimum temperatures at the low site were 1.2°C warmer than at the highest site (versus 0.8°C cooler in the dry valley). Thus, the mean daily temperature range at the 150 m level is only 0.4°C greater than at the highest level. Minimum temperatures at the middle site were 0.8°C warmer than at the highest site, while maxima were 0.9°C warmer.

A comparison of 17 months of concurrent temperature observations at the highest sites in both the west lake and dry valley transects shows the mean daily maximum and minimum temperatures are essentially the same at the two locations in the valley.

It is concluded, to answer the first question, that the temperature pattern in the lake valley is indeed different from the pattern in the dry valley. The difference is limited to elevations of 240 m and below, where daily minima average 0.8°C to 2.0°C warmer because of the lake. At the 305 m level, 2.5 km inland, there is no apparent effect of the lake on temperature. Daily maximum temperatures are not affected by the lake on an annual basis.

West vs. East Sides of the Lake

Now that it has been established that the lake affects air temperature of the surrounding land, the temperature difference between the west and east sides of the lake will be examined. Northwesterly winds prevail in central New York so one would expect the downwind (east) side to show the greater moderating influence of the lake. We assumed this would cause the east side of the lake to have warmer maximum temperatures in winter, cooler maxima in spring and summer, and warmer minima in autumn and winter.

The comparison between east and west sides of the lake at the highest level was made by examining the mean daily maximum and minimum temperatures of months for which a complete record of observations was present. Three to six years of observations are present for each month at the highest level. For example, the mean maxima could be compared for 3 Augusts, the mean minima could be compared for 5 Novembers, etc. The differences between the east and west sides were insignificant, except that the mean daily minima in August and November were 0.8°C warmer on the east side and were warmer on the east side for all years of observations in those two months. Also, maxima were 0.6°C cooler on the east side in September and October and were cooler in all years of observations for those months. Absolute monthly minima at the 305 m level were similar on either side of the lake for seven years of record. The absolute minimum for the period was -26.7°C on the east side and -27.8°C on the west side, both in January.

The lake influence was not found at the highest level on the west side when compared to the dry valley, but in late summer and autumn the temperature on the east side of the lake exhibits a slight moderating influence when compared to the west side.

The differences in mean daily maximum and minimum temperatures on either side of the lake at the middle level were greater than at the highest level. Four to eight years of observations are present for each month at the middle level. In general, the temperatures on the east side of the lake were cooler by day and warmer at night than on the west side year-around. A smaller daily temperature range is typical of maritime moderation, but it is surprising that the mean daily maximum temperatures in 7 out of 8 Januarys would be cooler on the east side, and average 0.8°C cooler, when January daily maxima average near -2°C and Cayuga Lake is rarely frozen more than a few tens of meters from shore. This paradox may be a result of increased low-level cloudiness as moistened air is forced to ascend the east side of the valley. The greatest difference in maxima occurred in March and April when the east side was 1.2°C cooler; the greatest difference in minima occurred in September and October when the east side was 1.4°C warmer. On an annual basis, mean daily maxima were 0.7°C cooler on the east side and minima were 0.7°C warmer on the east side. The absolute minimum for the eight-year period of record at the middle level was -27.7°C on the west side and -26.1°C on the east side, both within the danger range for tender grape varieties.

To answer the second question, there is slight moderation of autumn temperatures on the east side of Cayuga Lake at the 305 m level, but no lake effect during other seasons. At the 240 m level, temperatures differ by less than 1°C between opposite sides of the lake, except in the spring when the east side maxima are 1.2°C cooler and in autumn when the east side minima are 1.4°C warmer.

Areal Extent of the Lake Influence on Temperature

The third question posed in the introduction concerns the distance the lake influence extends from shore and has been partially answered above. It was established that the temperatures at the highest level on the dry valley and west lake transects were not different, but that minimum temperatures were moderated below the middle level on the lake transect. It was also established that temperatures at the highest level did not differ substantially between the west and east sides of the lake and temperatures on the east side of the lake were moderated more than temperatures on the west side at the 240 m level. Thus, the moderating influence of Cayuga Lake on temperature does not extend to 188 m above the lake and 2.5 km inland, minima are moderated to elevations 188 m above the lake and

1 km inland, and the lake influence extends farther from the lake on the east side than on the west side.

4. CONCLUSION

The results presented here indicate that the moderating influence of Cayuga Lake on temperature offers a significant advantage to tender grape varieties. The lake effect is most pronounced with minimum temperatures and does not extend 2.5 km inland or to elevations of 305 m. The cooler spring maximum temperatures and warmer autumn minima observed on the east side of the lake are beneficial in delaying early season growth and hastening maturity in autumn.

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VINES, WINES, AND REGIONAL IDENTITY IN THE FINGER LAKES REGION

JAMES L. NEWMAN

ABSTRACT. *Although the regional climate is unfavorable, microclimatic effects of the lakes and their valleys make viticulture possible. Production based on native American grape varieties that yield sweet wines is declining. Introduction of vines to produce dry wines has led to changes in operations and vineyard location that may create a new, positive image for the regional wines.*

WINE making has been described as the most geographically expressive of agricultural activities.[1] This characterization highlights the ensemble of environmental and human factors that produces distinctive landscapes with viticultural activities. Part of the distinctiveness is similarity. Vineyards are highly visible wherever they are, and a trained eye can easily identify the associated structures and technological paraphernalia.

Considerable regional diversity combines with similarity. The stately chateaux and small vineyards in the Loire valley look nothing like the new functionally designed buildings, set amid acre after acre of irrigated vines in the Hunter valley of Australia; nor would the German Rheingau be mistaken for Sonoma, California. The geography of wine does not end with a landscape. Color, smell, and taste of wine, including judgments about quality, most often stamp a region with its identity. The expressiveness of wine thus goes beyond what is usually observed and measured in geography. During the course of time, some regions have achieved such worldwide repute that a wine is virtually synonymous with them. For example, the Médoc portion of the Bordeaux region epitomizes how wine style and esteem can identify a place. Other examples where a wine and an area form an inseparable regional image are Champagne, Jerez, and the Moselle.

At the other end of the scale are areas with limited identity, an example of which is the Finger Lakes region of New York State. Wine has been produced there for more than a century, and it has been designated an approved U.S. viticultural area (Fig. 1). However, the region does not have a strong reputation as a wine-producing area. If the Finger Lakes region conjures an image, it tends to be of the past glaciers and the distinctive lakes that they left behind. Nonetheless, wine production is important in the region, and recent changes require a reassessment of old perceptions. The shifts have a potential for both expanding and enhancing the identity of the region as a wine-producing area.

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[1] H. J. De Blij, Wine: A Geographic Appreciation (Totowa. N.J.: Rowman and Allanheld, 1983), xii.

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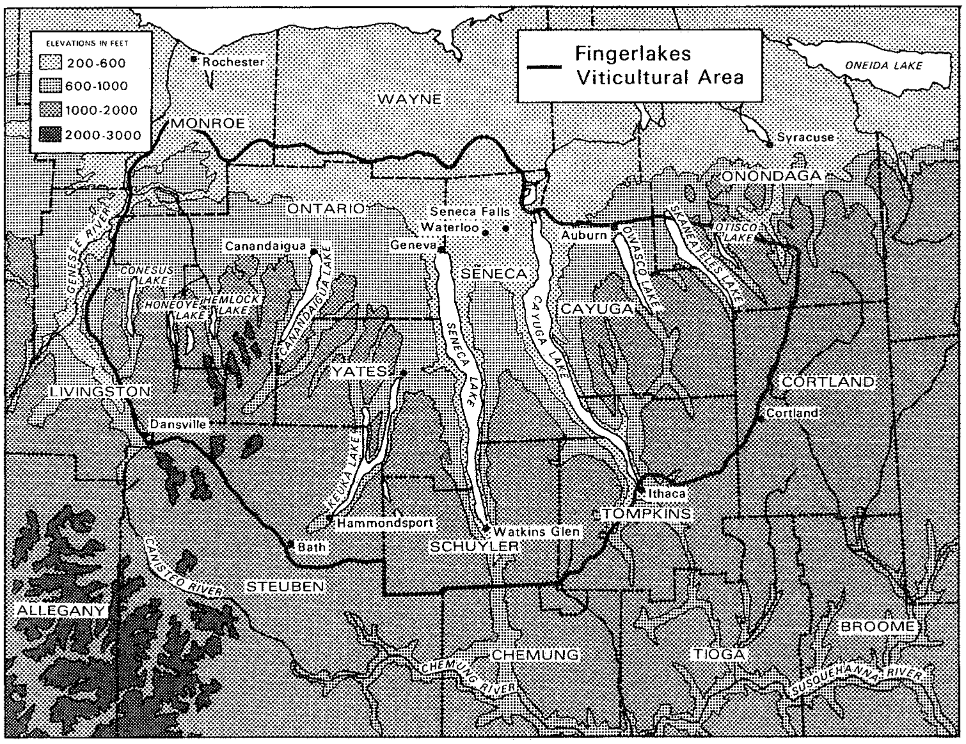

FIG. 1—The Finger Lakes viticultural area.

ENVIRONMENT

The Finger Lakes region takes its name from eleven narrow bodies of water in central upstate New York. Oriented south to north in a generally parallel fashion, they occupy through valleys, associated with Pleistocene glaciation. There were two major ice advances. The first did most of the heavy cutting, and the second left the current surficial deposits: drumlins, kames, eskers, moraines, and outwash plains.[2] An end moraine blocked the preexistent southward drainage and diverted stream flow northward into the newly emergent and sluggish St. Lawrence system. The through valleys began to fill with water, and the lakes were formed. The only notable post-glacial topographic features were rock gorges that resulted from tributaries cutting into resistant bedrock.

The region has a humid continental climate. Precipitation, averaging annually between twenty-eight and thirty-five inches, is distributed throughout the year (Fig. 2). Summers are occasionally dry, a circumstance with important consequences for yields and quality of grapes. An old rule of thumb asserts that vines require some stress to produce optimally, and

[2] O. D. von Engeln, The Finger Lakes Region: Its Origin and Nature (Ithaca, N.Y.: Cornell University Press, 1961).

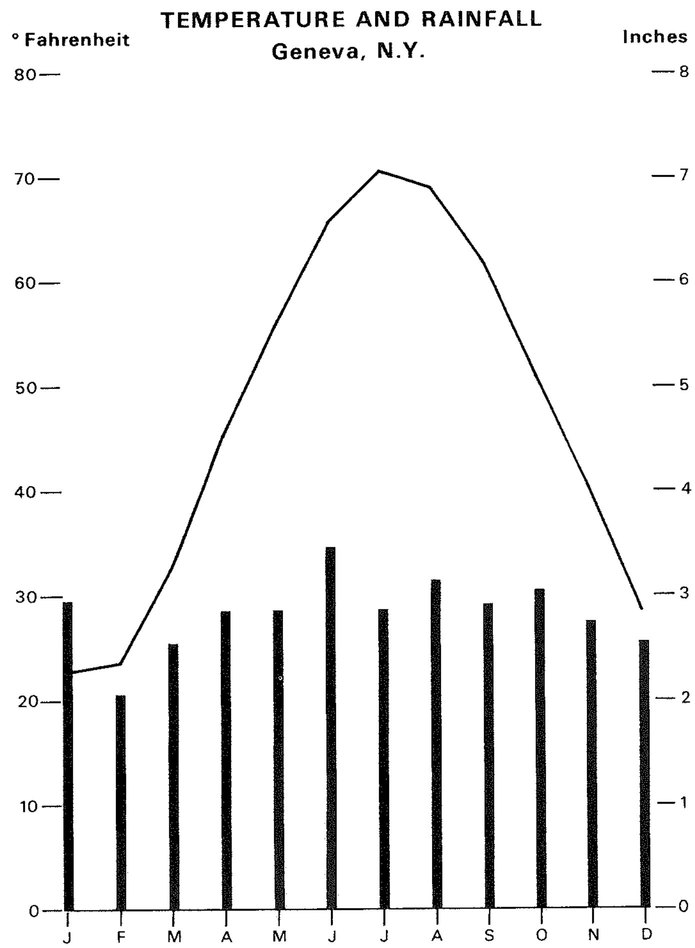

FIG. 2—Temperature and precipitation in the Finger Lakes region.

increasingly evidence seems to support this contention. An abundance of rainfall during the growing season is a source of even greater concern for wine growers. Early heavy storms can shatter new blooms and cause the fruit to set improperly, and excessive wetness can encourage growth of several mildews. Ideally most precipitation should fall in the winter, but in the Finger Lakes region 60 percent comes between April and October.

Temperature is a crucial factor. Winters are cold: temperature recordings below freezing are common. At these levels potential for damage to vineyards is considerable, ranging from destruction of primary buds to killing of vines. The growing season is relatively short. A general consensus is that a growing season of at least 165 days is needed to mature grapes to proper sugar levels.[3] The weather stations in the region average only 145 days for

[3] N. J. Shaulis, T. D. Jordan, and J. P. Tomkins, Cultural Practice for New Vineyards, *Extension Bulletin 805*, New York State College of Agriculture and Life Sciences, Ithaca, 1972.

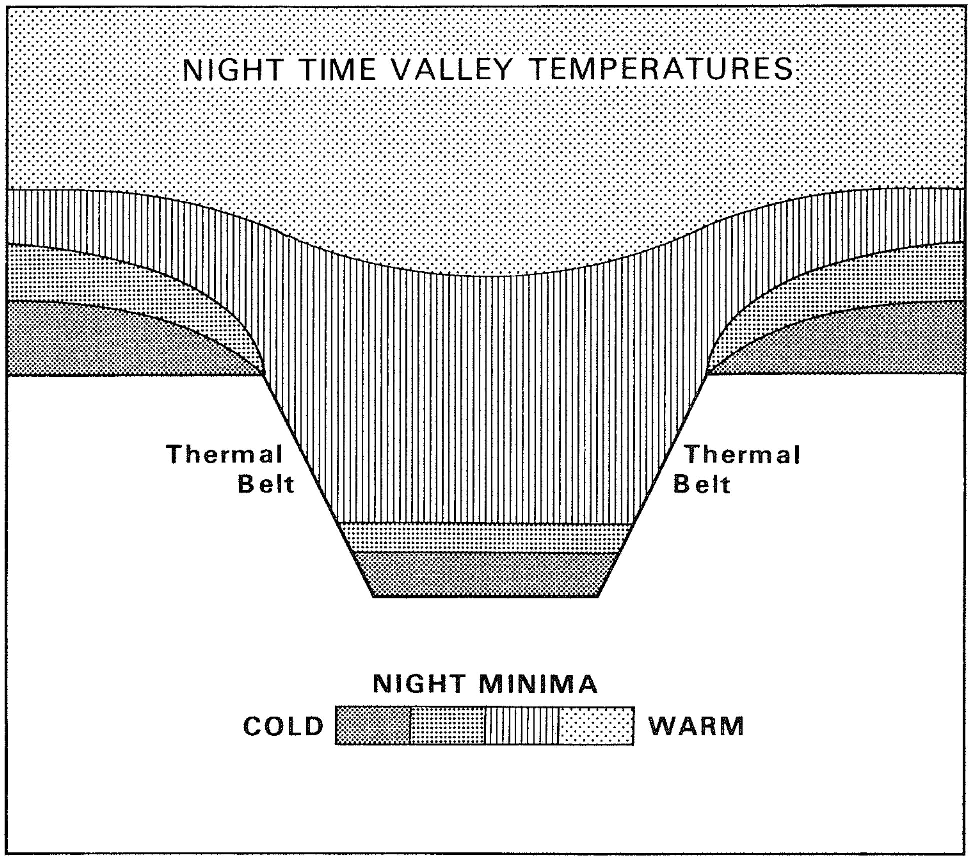

FIG. 3—Idealized nighttime valley temperatures. *Source:* Geiger, text footnote 5, 431.

a heat summation of 2,200–2,300 degree days. This total qualifies the Finger Lakes area as a Region I, or the coolest type in a classification of wine areas based on numbers of degree days.[4] On the basis of this classification, wine grapes should not be grown here, because ripening will be insufficient in most years. However, the average regional temperatures hide important microclimatic variations that are associated with the lakes and their valleys. These variations make viniculture possible in the Finger Lakes region. Unfortunately reliable data by vineyard sites do not exist. Consequently a theoretical extrapolation shows how the lakes and valleys alter the average temperature regime and patterns.

Cold air drainage is an important modifying factor in the winter. Cold air moves downslope at night and then along the base of the open valleys. This movement creates a thermal belt midway along the slopes, particularly on cold nights when it is below freezing, where temperatures can be as much as ten to fifteen degrees warmer than in adjacent areas (Fig. 3). Slopes

[4] A. J. Winkler, The Effect of Climatic Regions, *Wine Review* 6 (1938): 14–16.

FIG. 4—A view of the northern end of Keuka Lake. The slopes leading down to the lake provide a microclimate for viticulture.

with a southern orientation have the additional advantage of receiving more winter solar radiation than other surfaces to produce, in effect, an equatorial displacement (Fig. 4).[5] Contrary to popular belief, the lakes themselves do not appear to be a factor in any winter warming. Only lakes Seneca and Cayuga do not freeze, and even in them the water is too cold to warm the air significantly.

Spring brings the risk of late frosts that can kill emerging buds and severely damage canes. Once again the pattern of air drainage protects the slopes, but the lakes also play a role. The chill from the lake surfaces keeps the surrounding slopes cooler than they normally would be. Spring seemingly is delayed for approximately two weeks, enough time for the vines to survive the frost-risk period unscathed. During the summer, the lakes have the microclimatic role of reflecting sunlight onto the slopes. Although there is no verification of this effect in the Finger Lakes region, it is important along the Rhine River in Germany. If the process occurs in the New York area, the problem of excessive summer moisture would be somewhat ameliorated. Theoretically the west-facing slopes should receive the most benefits, because they catch the relatively warm afternoon rays.

Cold air drainage and release of heat, stored in the lakes during the summer, reduce the risk of early fall frosts. Together these factors seem to

[5] R. Geiger, The Climate Near the Ground (Cambridge: Harvard University Press, 1965), 370.

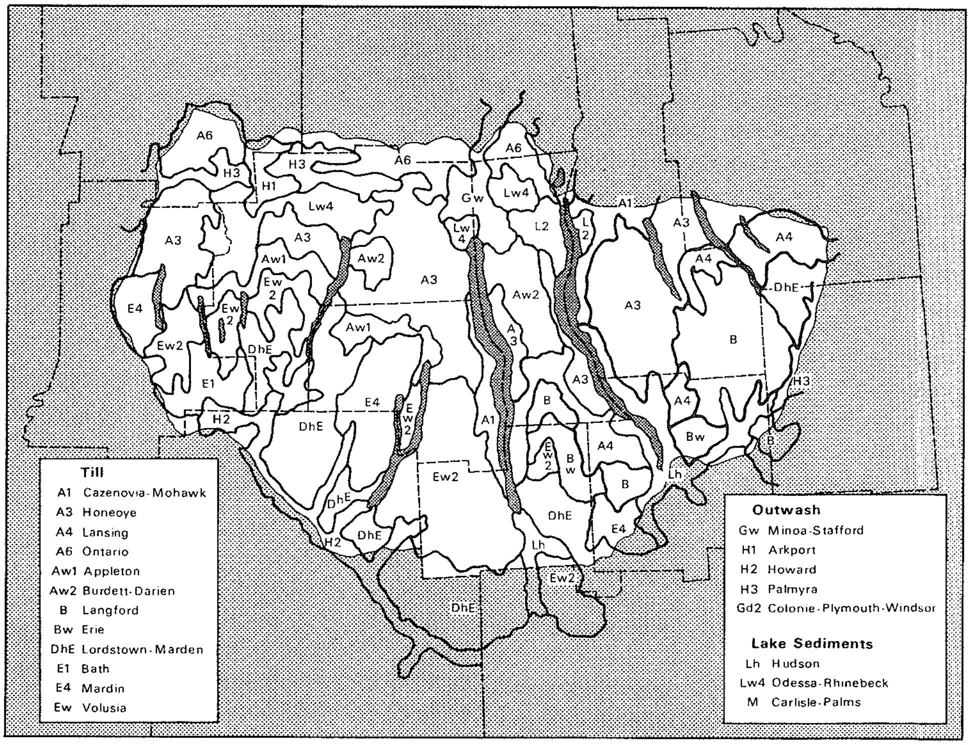

FIG. 5—Soil types in the Finger Lakes region. *Source:* U.S. Department of Agriculture, Soil Conservation Service, 1977.

extend the growing season on the slopes by three to four weeks and thus raise its length to a range of 165–170 days in most years. Heat summation probably approaches 2,400–2,500 degree days, so that the Finger Lakes region is reasonably within parameters for growing wine grapes.

Nothing is more perplexing to a student of viniculture than the role of soil. French tradition tends to reify it as the factor distinguishing the quality of vineyard sites in any region, whereas in the United States the significance of soil is generally downplayed in comparison with microclimate and technology. Both viewpoints can be supported, and unbiased research is needed to separate fact from myth. The situation does not differ in the Finger Lakes region, where depth, drainage, and reaction are the only soil characteristics to have been reliably studied.

Vines do best in deep, well-drained soils. Shallow soils can quickly become xeric, even in humid areas, with consequences such as increased likelihood of stunted vines, low yields, and poor-quality fruit. Most soils in the Finger Lakes region are deep, at least thirty inches, but bedrock is occasionally near the surface, as occurs along the western slope of Lake Seneca and in the Lordstown soils (Fig. 5).

Excessive moisture in a root zone can lead to overproduction of foliage, impaired fruit setting, growth of fungi and over time a generally weakened root system because of oxygen depletion. Poor drainage is widespread in the Finger Lakes region. Volusia and Langford soils have fragipans that trap water above them at depths of one to two feet, and the fine-textured Darien and Cazenovia-Mohawk subsoils retard downward percolation. At the northern end of Lake Cayuga the Montezuma Wildlife Reserve is associated with a vast expanse of swampy land. Overall, the deepest and best-drained soils are in the Honeoye, Howard, and Ontario groups.

Soil reaction is important because of differential vine responses. The lime-sensitive vines of native American origin (*Vitis labrusca*) prefer acidic soil conditions, but European-origin varieties (*Vitis vinifera*) flourish in soils with a relatively high lime content. Soils of both types can be found in the Finger Lakes region. The soils in the northern section, most notably ones in the Honeoye group, have a high lime content, resulting from their proximity to the Onondaga limestone formation that marks the boundary between the uplands and the Ontario lake plain. As glaciers moved over this formation, they absorbed cobbles and boulders that were deposited in the till and outwash. The southward dispersion was most pronounced along the through valleys.[6] Because the amount of limestone debris decreases toward the south, soils, derived primarily from shale and sandstone materials, become progressively more acidic. The pattern is displayed in the Howard, Volusia, Mardin-Lordstown, and Langford soil groups. Soil characteristics together with topography and microclimates form a mosaic on which the wine industry has been erected in the Finger Lakes region. However, other factors have helped to shape the region's identity.

Vines and Wines

The wine-making history of the Finger Lakes region began in 1829, when William Warner Bostwick, the Episcopal minister at Hammondsport, received some vine shoots from his father-in-law in Massachusetts. Bostwick planted them in the rectory garden.[7] Those *Vitis labrusca* cultivars, known as Isabella and Catawba, flourished, and other residents of the town soon cultivated them for the fresh fruit. Cultivation later became commercial to meet an accelerated demand in the eastern urban markets. The first recorded shipment of grapes outside the locale was to New York City in 1847.[8] Wine making dates from 1853, when a German immigrant planted two acres with Isabella and Catawba. The wine he made received a positive reception, and the industry was underway.[9]

By 1860 there were 200 acres of vineyards around Keuka Lake.[10] In addition to the original Isabella and Catawba vines other types of labrusca

[6] C. D. Holmes, Drift Dispersion in West-Central New York, *Bulletin of Geological Society of America* 634 (1952): 993–1010.
[7] L. O'Connor, A Finger Lakes Odyssey (Lakemont, N.Y.: North Country Books, 1975), 32.
[8] A. Merrill, Slim Fingers Beckon (New York: Stratford Press, c. 1951), 143.
[9] Ulysses P. Hedrick, A History of Agriculture in the State of New York (New York: Hill and Wang, 1966 [reprint of 1933 edition]), 390–391.
[10] Merrill, footnote 8 above, 144.

were planted. Delaware, Concord, and Niagara were well adapted to the cold winters, resisted diseases that had nullified all experiments with vinifera varieties in the eastern United States, and thrived on the acidic soils of the region. The steep slopes to the lake, which discouraged other commercial uses, provided a favorable microclimate for the vines. As in many European areas, grapes flourished where little else of value would. The Hammondsport and Pleasant Valley Wine Company was founded the same year. Its first crush of some eighteen tons of grapes occurred in 1862.[11] Three years later, the Crooked Lake and Urbana Wine Company was established to sell under the Imperial label.

Both companies achieved fame almost instantaneously, especially with their sparkling wines. Pleasant Valley won European awards in 1867 and 1873 and was identifying itself as the "Rheims of America" after the famous city in Champagne. With its sparkling wine being referred to as the "great champagne" of the Western world, the company changed its name to Great Western in 1871. Two Imperial wines won gold medals at the 1876 Paris International Exposition, and in 1887 the company renamed itself Gold Seal (Fig. 6).

In the wake of those successes, vineyard acreage increased around Keuka Lake from 3,000 in 1870 to 5,000 in 1879. Expansion continued during the 1880s. Walter Taylor added his name to the list of pioneers for the industry.[12] His vineyard north of Hammondsport joined Great Western and Gold Seal as one of the three firms that came to dominate regional wine making. Expansion of table-grape production continued, with Baltimore and Philadelphia becoming important outlets. By 1889 vineyard plantings around Keuka Lake totaled 14,000 acres, and by the end of the century the figure was 25,000 acres.[13] Steamboats carried harvested grapes across the lake to the railroad spur built specifically between Hammondsport and Bath for the grape and wine industry.

To the west a secondary center of production developed around the Naples valley at the southern end of Lake Canandaigua, where grape growing had commenced shortly after 1850. Maxfield Cellars was established there in 1861. In 1882 John Widmer planted his vineyard in the same locale, and he released his first wines in 1888. The O-Neh-Da Vineyard was established along the western side of Hemlock Lake. The property of the Roman Catholic see of Rochester, the vineyard made sacramental wines for the parish clergy.

Other wineries waxed and waned during the early years of the twentieth century, but the Finger Lakes region generally enjoyed a reputation for excellent sparkling wines and reliable good-quality table wines for the American market. The association with wine production was boosted by a

[11] O'Connor, footnote 7 above, 32.
[12] O'Connor, footnote 7 above, 34–35.
[13] Merrill, footnote 8 above, 144.

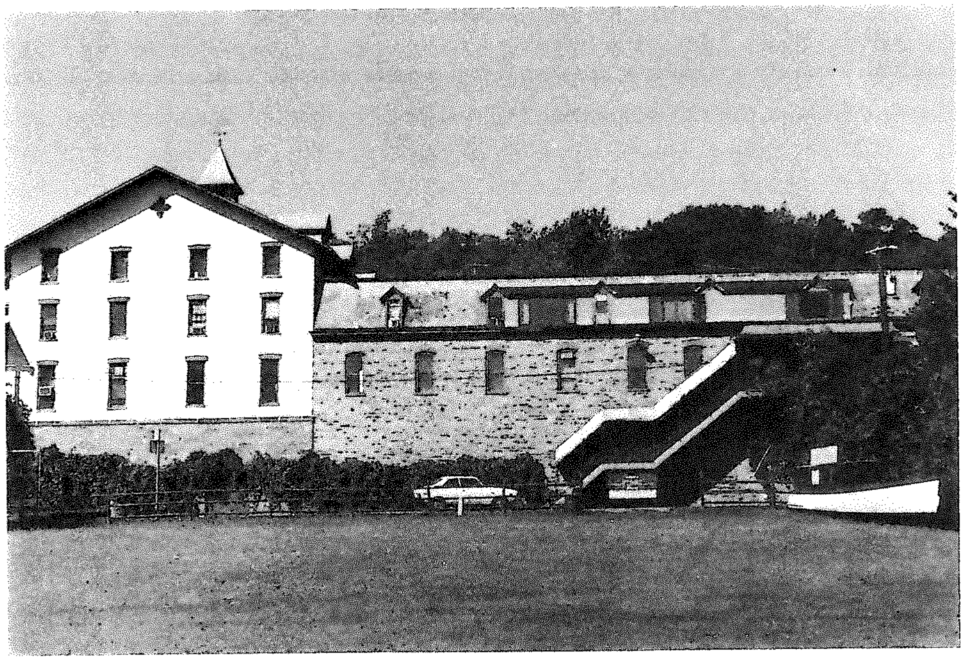

FIG. 6—The now idle Gold Seal winery is a symbol of the stress that wine production is undergoing.

decline in the acreage devoted to table grapes. Refrigerated railroad cars brought grapes from California to eastern markets, and the high yields attainable in the Central Valley meant prices that were well below what Finger Lakes growers charged. The fortunes of vineyards henceforth were tied to wine rather than other grape products.

The era of prohibition almost dealt a fatal blow to the entire regional enterprise. Seventeen wineries operated in the region in 1917. After the passage of the Volstead Act, only four survived: Great Western, Gold Seal, Taylor, and Widmer. Taylor purchased a fifth, Columbia, in anticipation of eventual repeal of prohibition. These wineries endured the period of restricted production by making sacramental and medicinal wines and by supplying grape juice for home wine making. A loophole in the Volstead Act allowed wines to be made as long as they were not sold. Many immigrants in the northeastern cities traditionally drank wine, and they kept the demand for juice high. Again California provided stiff competition, because the preference was for wines made from vinifera grapes rather than labrusca varieties. The latter have very strong grapey flavors and aromas, commonly referred to as "foxy," that tend to dominate the wines and to make them less satisfactory with meals. Also labrusca grapes are low in natural sugars and must be chaptalized for the juice to reach desired alcoholic levels. Consequently vinifera grapes from California increasingly predominated in the home-wine market.

Labrusca grapes actually have varied characteristics. The Delaware is grapey but does not display much foxiness, and it matures late so that natural sugar levels are relatively high. During the prohibition era, the Concord, one of the most stereotypical labrusca grapes, became predominant in the Finger Lakes region. Developed in Massachusetts during the 1850s, it displayed impressive winter hardiness and resistance to prevailing diseases and pests. With little effort, the vines produced substantial yields of large grapes that were suitable for eating or for making juice, preserves, and wine. To many growers in the area it seemed the ideal variety, especially when the future was so uncertain. By 1933, when prohibition was repealed, it was the grape of the region, indeed of the entire state.[14]

When wine making was revived in the mid-1930s, the dominance of the Concord was an advantage, because American preference had shifted in favor of sweet wines. Sugaring became the norm in household wine making, even when vinifera grapes were used, because they often arrived on the market either spoiled or unripe. The Concord was well suited for that demand, and a range of sweet sherries, ports, sauternes, and kosher-style wines soon became Finger Lakes specialties. Production of sparkling wines resumed on a reduced scale. Gold Seal led the way with the hiring of Charles Fournier as its winemaker from a prestigious Champagne firm. His employment continued a tradition of hiring Champagne-experienced personnel that dated to the founding of the firm.

World War II imposed a brief hiatus on wine making. Grape growing was profitable, but most of the harvest was used as table fruit or in the production of industrial alcohols. In the long run, the effect of the war was far-reaching, because many servicemen returned from Europe with a taste for dry table wines and created a demand for them. Producers in the Finger Lakes regions responded by making blends called Burgundies and Rhines and by releasing wines with varietal names and sometimes even with vintage dates. None enjoyed nationwide success, and all carried the stamp of their labrusca heritage. It was becoming certain that they could not compete successfully on the premium wine market with vinifera varieties from Europe and California. Increasingly products from the Finger Lakes region were described as grapey, foxy, and sweet, traits that meant an inferior wine among the growing number of cognoscenti.

Producers undertook efforts to improve the regional image by planting French-American hybrids. Serious attempts to cross vinifera and labrusca varieties dated from the first half of the nineteenth century, the initial success being Ada, a blend of Black Hamburg and Isabella.[15] Significant results were not achieved until the 1890s. Phylloxera had devastated the European vineyards, and there was a desperate search to develop vines that combined

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[14] Richard E. Dahlberg, The Concord Grape Industry of the Chautauqua-Erie Area, *Economic Geography* 37 (1961): 150–169.
[15] Hedrick, footnote 9 above, 390.

the wine-making qualities of vinifera and the disease tolerance of labrusca and other native American varieties. Thousands of acres were planted with these hybrids in France, but adoption was limited in the United States until after World War II. Prohibition delayed their introduction, and growers in the Finger Lakes region had little incentive to change. Philip Wagner of Maryland, the champion of French-American hybrids, predicted that Americans would consume more wine and that the labrusca vines would have to be replaced, if the eastern wineries were to capitalize on the opportunity.[16]

In the Finger Lakes region, Charles Fournier at Gold Seal began experimenting with two hybrids—Rosette and Ravat—immediately before the outbreak of World War II. The first release, which did not come until the end of the war, was a rosé from Widmer's that was made from Rosette but not labeled a varietal.[17] The subsequent pace of developments was very slow, and as recently as 1971 only 12 percent of the grapes purchased by the wineries were French-American hybrids. Then the Taylor firm began to exert its influence. It became the dominant regional producer, having acquired Great Western in 1961, with several hundred growers under contract in addition to its own vineyards. With financial incentives and technical assistance from the New York State Agricultural Experiment Station at Geneva, the firm encouraged its growers to plant the new stock and to convert old vineyards to the hybrids (Table I).

Two hybrids received special attention: Aurore for sparkling wines and blends with white labruscas, and de Chaunac, a red grape, hybridized in Canada, for the anticipated boom in red wine. That projection derived from the popularity of cold duck, a sweet sparkling wine made from Concords during the late 1960s. Both varieties were easy to grow and gave large yields; acreages expanded rapidly (Table II). Further impetus to the spread of the hybrids came from the establishment of Bully Hill winery in 1970 at the original Taylor site. This new winery focused on numerous French-American varieties and became a vociferous advocate for them.

Renewed experimentation with vinifera was also occurring. The culprit for all the early failures to grow vinifera in the northeastern United States was the same phylloxera that had swept across Europe in the late nineteenth century. After demonstration that a graft of vinifera onto native American rootstock, mainly *Vitis rupestris, riparia,* and *berlandieri,* overcame that hazard, the experimental station at Geneva conducted numerous trials with vinifera. By 1911 more than one hundred varieties had been planted, and optimism was high.[18] However, a promising development was again interrupted by prohibition. When the industry recovered, the prevailing opinion was that vinifera was simply not hardy enough to survive the rigors of winter in the region. A representative of Great Western asserted that "among

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[16] Philip. M. Wagner, American Wines and Wine-Making (New York: Alfred A. Knopf, 1956).
[17] Personal communication from J. Brahm, Widmer's Wine Cellars.
[18] U. P. Hedrick, Manual of American Grape-Growing (New York: Macmillan, 2nd ed., 1924), 190.

TABLE I—VARIETAL ACREAGES

VARIETY	1985[a]	1980	1975	1970	1966
Native American					
Catawba	1,800	2,459	2,341	1,862	1,267
Concord	4,600	5,299	5,743	5,641	6,250
Delaware	1,125	1,222	1,356	1,252	958
Dutchess	150	182	152	116	95
Elvira	490	499	430	299	301
Fredonia	15	20	—	29	32
Isabella	30	40	64	56	41
Missouri riesling	—	—	—	21	47
Moore's diamond	55	79	95	84	19
Niagara	580	736	809	625	533
Hybrids					
Aurora	1,400	1,585	1,441	841	360
Baco noir	420	518	572	272	65
Cayuga white	200	74	—	—	—
Chancellor	30	18	23	—	—
Cascade	—	57	91	98	44
Chelois	40	32	59	16	13
Colobel	55	58	52	19	—
de Chaunac	520	642	583	98	—
Leon Millot	16	16	—	—	—
Marechal Foch	75	90	131	19	—
Rosette	100	113	87	81	64
Rougeon	220	236	213	149	31
Seyval blanc	230	172	71	—	—
Vidal	85	75	—	—	—
Vignoles	75	51	34	—	—
Vincent	—	—	44	—	—
Vinifera					
Chardonnay	250	125	82	—	—
Gewürztraminer	25	16	—	—	—
White riesling	230	123	106	—	—
Other	200	153	210	194	82

Source: New York State Crop Reporting Service, Orchard and Vineyard Surveys for 1966, 1970, 1975, and 1980.
[a] Estimates by author.

TABLE II—VINE PLANTINGS BY COUNTY IN 1980 (%)

COUNTY	LABRUSCA	HYBRIDS	VINIFERA
Ontario	89.5	10.5	—
Schuyler	82.6	17.4	—
Seneca	59.0	31.0	10.0
Steuben	71.9	26.0	3.0
Wayne	100.0	—	—
Yates	77.4	22.0	0.6

New York producers, we have encountered little general interest in varieties of *V. vinifera.* Emphasis here is still on sound and aggressive sales of the outstanding products derived from our native New York state grape varieties . . . ."[19]

[19] K. H. Kimball, Another Look at Vinifera in the East, *Wines & Vines* 42 (1961): 63–67.

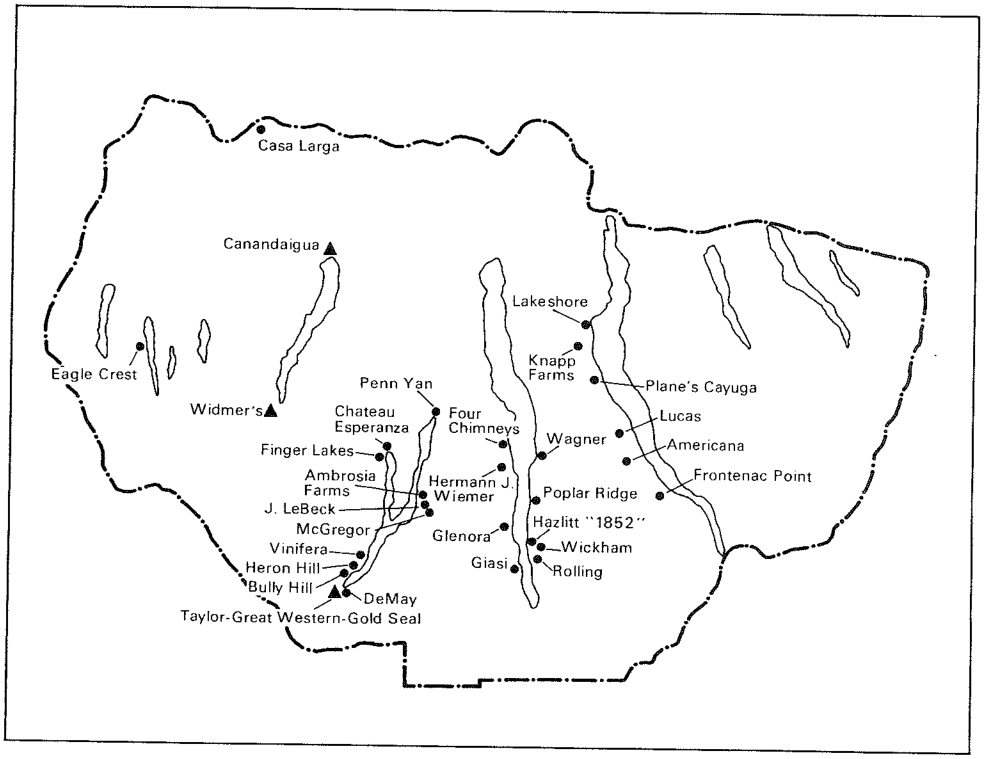

FIG. 7—Wineries of the Finger Lakes region in 1985.

Konstantin Frank, an émigré of German descent from the Soviet Union, heard that viewpoint on his arrival in the Finger Lakes region in 1952. Having grown vinifera under much harsher conditions in the Ukraine, he was certain that they would thrive with proper care in central New York. He convinced Fournier to allow him to experiment, and within several years he had demonstrated the validity of his contention. By the beginning of the 1960s Gold Seal was producing wines made from pinot noir and chardonnay. To further his experiments, Frank founded his own winery in 1963, where he tried sixty varieties. However, most of the seventy acres were planted with riesling, chardonnay, pinot noir, and gewürztraminer.

Passage of the New York Small Farm Winery Act in 1976 aided the spread of both French-American hybrids and vinifera. By lowering taxes and licensing fees, the act encouraged a new scale of operations in the wine industry, an eastern parallel to the so-called boutique wineries in California. By 1985, twenty-six wineries of this sort, each featuring hybrids or vinifera, had opened in the region (Fig. 7).

As a result, two subregions have emerged. The zones of lower elevation, gentle slopes, pronounced lake effect, and high lime soils around lakes Seneca and Cayuga are well suited to the new vines, especially vinifera. Fournier recognized this fact in the 1950s and established the Gold Seal vinifera vineyard on the eastern side of Seneca Lake. Since 1976 these two lakes have been the regional focal point for small-farm wineries. By contrast, labrusca vines and large producers still dominate in the old core around lakes Keuka and Canandaigua.

One winery, Casa Larga, is isolated from either subregion, although it is included in the Finger Lakes viticultural area. Located immediately outside the city of Rochester atop the highest point in the area (850 feet), elevation protects the vineyards from early or late frost damage, and the moderating influence of Lake Ontario is greater than that of any finger lake. Heavy winter snows help insulate the vines, and the growing season is seven to ten days longer than in the Finger Lakes region. Hence this site is well suited for vinifera.

The new vines have led to new wines that differ totally from the regional stereotype. Of the vinifera, riesling has adapted very well, and wines similar to good-quality Rhines and Moselles are produced with increasing frequency by many wineries. Expectations are that further improvement will be forthcoming as experience accumulates. Chardonnay—the grape of white Burgundies, the finest Champagnes, and many highly esteemed California wines—also shows promise both as a varietal still wine and as a source of improved-quality sparkling wines. These are two of the so-called "noble" grapes, production of which most authorities consider essential to achieve status within the world of wine.

Among the various hybrids, Seyval Blanc, Vignoles, and Cayuga have gained the widest followings. Their wines are usually described as having a simple, straightforward fruitiness without any hint of the grapey or foxy overtones derived from the labrusca side of their heritage. Although these hybrids will probably never produce a great wine, they are capable of good ones for everyday drinking. They are on par with some European regional wines and are better than many local or country European varieties.

These hybrids are whites; reds have not fared as well. Baco noir, Chancellor, and Marshal Foch have some advocates, but the wines made from them do not age well because of the low tannin levels in the grapes. They thus cannot develop the complexities of aroma and taste that enthusiasts seek in red wines. Pinot noir, the grape of the red Burgundies, seems to be the only red vinifera with a commercially viable future, and experiments with it are continuing. The growing season in the Finger Lakes region is too short for the other varieties of red vinifera.

A New Identity?

Will these changes lead to a new identity for the Finger Lakes area as a wine-producing region? Will the labrusca-dominated image be replaced, or at least modified, by one that recognizes the presence of European-styled white table and sparkling wines? The potential exists, but achievement faces several constraints.

Inertia is one. Opinions, especially ones about wine, die hard. Whether formed by tasting wines or reading about them, initial impressions often become firmly fixed. Once an opinion is formed, individuals either ignore a wine or continue to find what is expected. Especially crucial in this regard is the influence of popular writers about wine. What they feature and how they evaluate have far-reaching effects. Unlike patterns for other agricultural commodities, subjective sensory impressions, shaped by a relatively small number of opinion makers, determine values.

TABLE III—WINE-PRODUCING CAPACITY 1985

WINERY	CAPACITY (gals.)
Taylor–Great Western–Gold Seal	30,000,000[a]
Canandaigua Wine	12,000,000[a]
Widmer's Wine Cellars	3,000,000
Penn Yan Cellars	300,000
Bully Hill	250,000
Wagner Vineyards	40,000
Glenora Wine Cellars	35,000
Eagle Crest Vineyards	30,000
Heron Hill	25,000
Vinifera Wine Cellars	20,000
Wickham Vineyards	20,000
Casa Larga	15,000
Plane's Cayuga Vineyard	15,000
Herman J. Wiemer	15,000
DeMay Wine Cellars	10,000
Finger Lakes Wine Cellars	10,000
Lucas Winery	10,000
McGregor Vineyard	10,000
Poplar Ridge Vineyards	10,000
Chateau Esperanza	9,900
Four Chimneys	6,000
Ambrosia Farms	5,000
Giasi Winery	5,000
Rolling Vineyards	5,000
Hazlitt 1852 Vineyards	4,500
Knapp Farms	4,000
Americana	3,200
J. LeBeck	3,200
Frontenac Point	3,000
Lakeshore Winery	3,000

Source: J. M. Morris and J. Sherman, Wineries of the Finger Lakes (Ithaca: Isodore Stephann's Sons, 1985).

[a] Estimated.

A related consideration is the tendency of a regional image to be determined by a few producers. European examples include Bordeaux and Burgundy. In the Finger Lakes region, the well-known brand names have a long association with the traditional wines and continue to dominate the market. Wineries that have concentrated efforts on wine-style changes have a small volume and limited visibility outside the region (Table III).

To become better known would require expansion, which is very difficult to initiate in current circumstances. In contrast with California, wineries in the Finger Lakes region are not attracting investments. The new wineries are overwhelmingly family operations that are struggling to remain solvent. Wine consumption in the United States has not expanded as predicted in the 1970s, and inexpensive imports compete for the market. Another marketing problem is the strange new varietal names of the hybrids. Most of them are unfamiliar to wine drinkers, except extremely knowledgeable experts, who are sometimes uncertain, because few organoleptic standards exist.

Recent news reports imply that the Finger Lakes wine industry is on the verge of collapse. They started in 1984 with the closing of the Gold Seal Winery, then recently merged with Taylor and Great Western. The reports escalated after Taylor suspended guarantee-purchase contracts in 1985.

In the aftermath of these decisions, the Finger Lakes region is dotted with unpicked and abandoned vineyards, especially in the labrusca-core area around Keuka Lake. Growers that planted Aurore and de Chaunac in the 1960s and 1970s also have suffered adversely because the varieties are not well-suited for wine, and few other demands exist. Widespread replanting is not an option for most growers, because cost runs between \$3,000 and \$4,000 an acre. There must be a two-year interval for the phylloxera to die before rootstock can be replaced, and another three-year period before a crop is harvested. Less expensive field-grafting might be possible, but many vineyards are on sites unsuitable for vinifera and the better hybrids.

There is no doubt that the Finger Lakes wine industry is in a state of crisis. However, total collapse is unlikely in view of the region's history and some recent successes with wine making. Adjustment to the realities of current market trends is difficult. Producers of labrusca and less-valuable hybrid vines may cease operations with a consequence of an overall decline of vineyard acreage in the region. This contraction, however, has the potential to improve the industry in the long term. When an increased proportion of wine is made from vinifera and better hybrids, the identity of the Finger Lakes area as a wine-producing region should improve.