SOIL SURVEY OF YATES COUNTY, NEW YORK.

By E. T. MAXON.—Area Inspected by W. E. McLENDON.

DESCRIPTION OF THE AREA.

Yates County is situated in the central part of western New York. On the east Seneca Lake separates it from Seneca and Schuyler Counties, on the south the county is bounded by Schuyler and Steuben Counties, and on the west and north by Ontario County. Yates County has an area of 343 square miles, or 219,520 acres.

The surface ranges from undulating or gently rolling in the extreme eastern and northeastern parts of the county to hilly or semimountainous in the southern and southwestern parts. Starkey and Torrey Towns and the eastern part of Milo and Benton Towns are as a whole undulating to gently rolling. This part of the county may be considered as including two topographic divisions, the one comparatively smooth, the other more rolling. The smoother belt lies in the eastern part of Milo Town and the northeastern part of Starkey Town, and consists of a sloping plain, bordered by very narrow, deep ravines which have been cut back a short distance from the Seneca Lake front. The more rolling part consists of relatively smooth hills, with gentle slopes, giving way in the northwestern part of Benton Town and the northeastern part of Potter Town to low, rounded hills of drumloidal character.

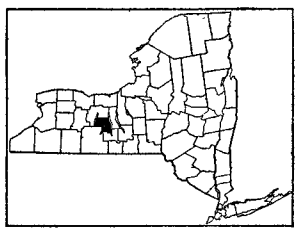

FIG. 4.—Sketch map showing location of the Yates County area, New York.

Most of the upland is rolling and included in five distinct ridges. These extend in a general north-south direction and have for the most part rather flat tops and steeply sloping sides. The intervening valleys are comparatively narrow and deep.

There is a range in elevation from 440 feet above sea level along Seneca Lake to 2,110 feet in the southwestern part of the county. The greatest variations in elevation occur along the valleys in the western part of the county, especially the Middlesex and Italy Hollow Valleys, where the hills rise as much as 600 to 800 feet in half a mile. Benton, in the northeastern part of the county, has an elevation of 838 feet above sea level; Overacker Corners, in the northwestern part, 1,036 feet; Italy Hill, in the southwestern part, 1,605 feet; and Dundee, in the southeastern part, 985 feet.

The upland region of the county is fairly well drained through small streams and depressions that reach nearly every farm. West River and Flint Creek are the two largest streams in the northwestern part of the county. Their tributaries flow rapidly until the flats are reached, where the streams meander sluggishly through swamps. The largest watercourse in the southeastern part of the county is Big Stream, which flows in an easterly direction, emptying into Seneca Lake through a deep ravine. Most of the drainage of Yates County empties into Lakes Canandaigua, Keuka, and Seneca, and ultimately reaches the St. Lawrence River, Keuka Lake Outlet, with a descent of 260 feet in 7 miles, affords excellent water power for a number of paper and grist mills.

The first permanent white settlement in Yates County was made south of Dresden in 1788. Following this settlements were established throughout the uplands. The pioneers came from Rhode Island, Connecticut, and Pennsylvania. In 1880 the population of Yates County was 21,087. By 1909 the population had decreased to 18,642. The loss has been greater in the rural districts than in the towns. The present population is largely made up of descendants of the pioneers, the newcomers being English, German, Norwegian, and Dutch. About 75 per cent of the population is rural. The density of the rural population is given by the census of 1910 as 40.9 persons per square mile.

Penn Yan, the county seat, with a population of 4,509, is the largest town in the county. It is on two railroads and at the foot of navigation on Lake Keuka, and is an important trading center. Other towns, with their population in 1910 are: Dundee, 1,228; Rushville, 463; Dresden, 345; Middlesex, 320; Himrod, 318; Branchport, 273; and Bellona, 200.

The county is fairly well supplied with transportation facilities. The Northern Central and New York Central railroads traverse the eastern part north and south, and a branch line of the Lehigh Valley System extends through the northwestern part. An electric railroad carrying both passengers and freight runs from Penn Yan to Branchport. Boat service is available during part of the season on Lakes Keuka, Seneca, and Canandaigua. These various transit lines provide efficient service for the shipping of farm produce and perishable fruit.

The public roads are in good condition. The main road north and south through the county, passing Benton Center, Penn Yan, and Dundee, is of macadam construction. Every town in the county makes a more or less systematic effort to keep the dirt roads in good condition, and it is only in the more remote and rougher sections that difficulty is encountered in hauling farm produce. Rural mail delivery and telephone service is available to most farms.

Penn Yan, Dundee, Dresden, Bellona, and Rushville are the most important local markets. The principal markets outside the county are Buffalo, New York, Boston, Philadelphia, Baltimore, and the coal-mining towns of eastern Pennsylvania.

CLIMATE.

The climate of Yates County is similar to that prevailing throughout western New York. The numerous bodies of water moderate the temperature in their immediate vicinity and are responsible in a measure for the form of agriculture carried on. Their influence is especially important in grape growing, which flourishes along these lakes.

Climatic statistics from the Weather Bureau station at Shortsville, in Ontario County, at an elevation of 640 feet above sea level, are applicable to the eastern part of Yates County and to the region immediately bordering the lakes, but they apply in only a general way to the higher elevations of the county. The following table gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at Shortsville:

Normal monthly, seasonal, and annual temperature and precipitation at Shortsville, Ontario County.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1911).	Total amount for the wettest year (1901).
	° *F.*	° *F.*	° *F.*	*Inches.*	*Inches.*	*Inches.*
December	27.8	63	— 6	2.00	1.86	2.44
January	24.7	64	—12	1.80	.52	1.31
February	21.8	62	—16	1.60	1.14	1.31
Winter	24.8	64	—16	5.40	3.52	5.06
March	32.8	84	— 5	2.30	1.59	1.26
April	44.0	88	15	2.90	1.31	4.93
May	56.1	90	28	2.70	1.99	3.56
Spring	44.3	90	— 5	7.90	4.89	9.75
June	65.2	89	36	3.20	1.69	2.65
July	70.2	102	44	4.10	3.14	4.62
August	67.9	93	43	2.90	3.94	5.60
Summer	67.8	102	36	10.20	8.77	12.87
September	62.7	91	34	2.60	3.57	2.35
October	51.5	82	26	2.80	2.46	1.11
November	39.0	75	11	1.90	1.18	1.87
Fall	51.1	91	11	7.30	7.21	5.33
Year	47.0	102	—16	30.80	24.39	33.01

The winters are moderately cold and the summers are warm. The average length of the growing season is 163 days. Shorter seasons prevail in the hill lands, especially in the poorly drained areas. The average date of the last killing frost in the spring as recorded at Shortsville is May 8, and that of the first in the fall, October 19. Killing frost has been recorded here as late in the spring as May 31, and as early in the fall as September 30.

The precipitation is well distributed throughout the year, averaging 5.40 inches for the winter, 7.90 inches for the spring, 10.20 inches for the summer, and 7.30 inches for the fall. The rainfall is heaviest during the growing season and lightest during the harvesting and winter months. Snow usually covers the ground during most of the winter.

AGRICULTURE.

At the time of settlement this region was heavily forested with hard maple, white oak, hickory, and black walnut, especially in the section adjacent to Seneca Lake; chestnut grew on the dry ridges, and ash, elm, butternut, basswood, and pine on the higher hills of Jerusalem and Barrington Towns. Wild fruits, consisting largely of plum, cherry, grape, and raspberry, grew in profusion. The Indians had cleared small patches of land, on which they grew corn. The white settlers cleared the land on a larger scale and grew wheat, corn, and vegetables. Some cattle and sheep were kept, the milk being made into butter and cheese and the wool into clothing. With the development of agriculture, wheat, corn, oats, barley, butter, cheese, and wool were produced in sufficient quantities for sale. They were carried over the lakes to the larger markets until 1852, when the Northern Central Railroad extended its line through the county. The building of this line encouraged the production of fruit and perishable produce.

At present the agriculture of Yates County consists of the production of grain, hay, beans, apples, and grapes. Dairying and sheep raising are carried on to some extent. The acreage devoted to corn, oats, wheat, barley, and buckwheat has decreased in the last 30 years by 25,633 acres.

In 1879 there were 11,765 acres in corn, which gave an average yield of 41 bushels per acre. The acreage has gradually decreased since that year, and in 1909 corn was grown on only 8,987 acres. Corn is being used to an increased extent as ensilage for dairy stock.

The area in oats has steadily increased from 11,159 acres in 1879, yielding an average of 34 bushels per acre, to 19,389 acres in 1909, yielding 23 bushels per acre. The decrease in yield may be due to the use of less productive land. The oat crop is largely fed on the farm.

Wheat has always been an important crop in this section, but the acreage has varied widely during the last 30 years. In 1879 24,649 acres produced 347,250 bushels, or an average of 14 bushels per acre. By 1889 the acreage had dropped to 14,337 acres, but the yield per acre averaged 18.8 bushels. In 1899 22,431 acres were seeded to wheat, which produced 390,740 bushels. In 1909 only 12,090 acres were reported, but the average yield amounted to 24 bushels. The acreage from year to year is largely dependent upon market conditions, as most of the wheat is sold.

Barley became one of the important crops at an early period. The highest production was attained in 1879, when 21,961 acres were seeded, producing 506,351 bushels, or an average of 23 bushels per acre. Since 1889, when 16,877 acres were seeded, the acreage has decreased rapidly, and only 2,009 acres were devoted to barley in 1909.

Buckwheat and rye have been grown to a greater or less extent during the last 50 years. The area in buckwheat increased from 1,311 acres in 1879 to 2,737 acres in 1909, and of rye from 717 acres to 3,179 acres during the same period. These crops are generally grown for use on the farm.

The growing of potatoes for sale has not been extensively developed. In 1879 potatoes were grown on 1,759 acres. The acreage has remained almost stationary, the crop occupying 2,667 acres in 1909. The production in that year was 235,657 bushels.

Beans have long been an important crop. The production of beans has ranged from 12,109 bushels in 1879 to 6,442 bushels in 1889 and 49,857 bushels in 1899. In 1909 62,037 bushels were produced on 6,042 acres, the average yield being about 10 bushels per acre.

The acreage devoted to hay and forage crops has not shown much change during the last 30 years. In 1879 hay was harvested from 28,800 acres and produced 27,249 tons. In 1909, 39,961 acres produced 39,804 tons. About half the hay consists of clear timothy, which is usually baled and sold. The mixed timothy and clover hay is largely fed to work stock on the farm. The acreage in alfalfa is being gradually extended.

The natural adaptation of this region to fruit was recognized by the Indians, who set out apple trees, and later by the white settlers, who grew also other fruits. In the 30-year period from 1879 to 1909 the annual value of the orchard products of Yates County has increased from $84,322 to $806,977. About 23 per cent of the total income from all farm products is derived from fruit. The census of 1909 gives the production of tree and small fruits as follows: Apples, 238,606 bushels; peaches, 23,809 bushels; plums, 13,702 bushels; cherries, 4,364 bushels; quinces, 1,437 bushels; strawberries, 67,293 quarts; and raspberries, 854,517 quarts. A large proportion of the raspberries

are dried on the farm and sold by the pound. In 1909 there were 7,920 pounds of nuts gathered.

The production of grapes on the steep hillsides bordering the lakes has long been an important industry. Plantings were first made about 1855. The acreage was gradually extended with the introduction of wine making. In 1909 there was an estimated area in grapes of 7,940 acres.[1]

The census of 1910 reports a production of 36,941,168 pounds of grapes in Yates County. The grapes are either packed in baskets for the retail trade or are made into wine. A large proportion of the champagne produced in the United States is made around Keuka Lake. The Concord, Catawba, Delaware, and Niagara grapes are most extensively grown.

The early settlers brought a few cattle and sheep and began stock farming on a small scale. Butter and cheese were manufactured for home consumption, but dairying never became an important industry. The 1910 census reports a total of 10,303 cattle in the county, of which 5,566 were milch cows. Most of the milk from the dairy farms is made into butter. In 1909 the value of all dairy products, excluding milk and cream used in the home, was $192,714. In proportion to its area, Yates County is one of the leading counties in the State in sheep raising and wool production. In 1910 there were 36,554 sheep in the county, having a valuation of $181,244. The 1910 census reports 7,884 hogs on farms. Much of the pork produced is used for home consumption, the surplus being disposed of through the local markets. On nearly every farm some poultry is raised, the average number kept per farm being 55 fowls. In 1909 there were 572,085 dozen eggs sold, and the receipts from the sale of poultry and eggs amounted to $148,682. The value of the honey produced in 1909 was $2,816.

It has long been recognized that the topography of the land is an important factor in grape growing. The most successful vineyards are found along the slopes adjacent to large bodies of water, on land that would otherwise be practically valueless for crops. The farmers realize that apples and peaches do better on soils of the Ontario series than they do on the hill lands embraced in the Volusia series. Most of the farmers recognize that it is very difficult to obtain a stand of alfalfa on any soils except strong, well-drained types, such as the members of the Ontario, Chenango, and Wooster series. It is also recognized that wheat does better on brown silty soils, usually derived from limestone, than on lighter colored and somewhat lighter textured soils derived from sandstone and shale. The hill farmers recognize the difference between the Volusia and Wooster soils in potato

[1] Bul. 315, N. Y. Agr. Expt. Sta., Geneva, N. Y.

production, the difference being mainly in thoroughness of drainage and aeration.

In growing corn the crop is put in with a planter and cultivated several times in the season. When mature it is cut, shocked, and later husked in the field. The ears are usually stored in cribs. The roughage is fed to cattle during the winter. On farms devoted to dairying, the corn is cut before the grain matures and made into silage for winter feeding. The bean crop is also largely handled with machinery, from the planting to the thrashing. Oats and wheat are generally harvested with binders and stored in barns until thrashed. The straw is stacked in the yard, so that the stock may have access to it throughout the winter. The following season the refuse from the straw pile is hauled to the fields and plowed under. Hay is harvested by machinery and either stored in the barn or stacked.

Every successful orchard in the county is carefully trimmed and sprayed. The fruit is hand picked and either packed in barrels on the farm or taken to commission houses in the larger towns. Damaged fruit is sold largely to the evaporators and cider presses. Commercial berry patches receive careful attention during the season, and as the fruit matures it is placed in trays and artificially dried.

In grape growing the high-renewal system of propagation is largely used. The head of the trunk is 20 to 30 inches above the ground. The trellis usually consists of three wires 18 inches apart, the lowest 20 inches above the ground. New canes are brought out of the renewal stubs, and once in two or three years an attempt is made to bring them directly from the head of the main trunk. Regular cultivation is given throughout the season. Some growers use cover crops of rye and buckwheat later in the season. The grape-leaf hopper and grapevine flea beetle are possibly the worst insect enemies, and they are not very troublesome. Fungus diseases cause more trouble, but they can be controlled.

According to the 1910 census, 35.5 per cent of the total value of farm property in Yates County is represented by buildings. The farm dwellings are substantial and are usually painted and in good repair. The barns are well suited to the requirements. The basement is fitted up for stock or for the storage of tools; the upper part contains granaries, seed rooms, and mows for the storage of hay. Smaller buildings are used for poultry and hogs and to shelter machinery. On the higher hills the buildings are smaller and in poorer condition. In good farming localities the fields are well fenced. Six and six-tenths per cent of the value of all farm property is invested in machinery. The implements in use include walking and riding plows, cultivators, mowing machines, hay loaders, binders,

and corn and bean harvesters. Several farmers own gasoline and kerosene tractors, ensilage cutters, and thrashing machines.

Horses are used almost exclusively for draft work. In 1910 there was an average of three horses to every farm. The horses are large boned and heavy, well adapted to the type of farming.

There are many breeds of sheep represented in this county. Probably the Shropshire and Delano Merino are in the majority. On the farms devoted to dairying some purebred Holstein and Jersey animals are kept, but most of the cattle are grades of mixed breeding.

The farmers in general realize the value and necessity of proper crop rotations, and in the eastern and northern parts of the county crops are systematically rotated, but on the hill farms little attempt is made to follow a rotation. A system of rotation commonly followed on the Ontario soils, and to some extent on the Wooster soils is as follows: Corn or beans the first year; beans, cabbage, or oats the second year; wheat, with timothy and clover sown, the third year; and mixed timothy and clover the fourth year. Many of the farmers mow the fields only two years, plowing under a heavy sod for the cultivated crop. The common rotation on the higher hill farms is as follows: Corn one year; oats one year; seeded to grass for four or five years; buckwheat, beans, or potatoes one year; and then back to corn. During the last few years wheat has had a place in this rotation. Fields planted to grapes and small fruit are cultivated regularly during the early season, and cover crops of rye and buckwheat are later sown.

Commercial fertilizers have been used in this county for many years, and the quantity is gradually increasing. In 1909 nearly 61 per cent of all the farmers used fertilizer, at a total cost of $57,802. Barnyard manure and rotted straw is used on nearly every farm, the manure being usually put on sod for corn or on land to be devoted to wheat. Small quantities of commercial fertilizer are distributed when the wheat is sown. Cabbages and beans often receive some commercial fertilizer. Ground limestone is not in general use.

Farm labor is scarce throughout most of the county. From $25 to $35 a month and board is paid for ordinary farm labor. Day laborers during harvest receive $2 to $3 a day. The total amount expended for labor in Yates County in 1909 was $439,260, an average of $236 for each of the 1,864 farms reporting the use of hired labor.

From 1880 to 1900 the number of farms in Yates County increased from 2,279 to 2,504, but during the last decade the total number decreased to 2,288. In 1909, 93 per cent of the total area of the county was in farms and 81.7 per cent of the farm land was improved. The average size of the farms is increasing, the average farm at present containing 89.3 acres. Of the total number of farms in the county in

1909, 1,754, or 76.7 per cent, were operated by owners, and 513, or 22.4 per cent, by tenants. Most of the tenanted farms are rented on shares.

Land values vary considerably throughout the county. The highest priced farms are in the eastern and northeastern parts of the county, in the region of the Ontario soils, where values range from $100 to over $200 an acre. These farms usually have good buildings and include some land in fruit. Farms on the Wooster and Chenango soils are held at $50 to $150 an acre, according to location. Farms on soils of the Volusia series vary in price from $5 to $100 an acre. The valuation of farm land, aside from farms on the Ontario soils, is based upon the topography, elevation, and accessibility to shipping points and markets, rather than upon the actual producing power of the soil. Land values in Yates County are relatively high in comparison with similar types of soil of equal desirability in other parts of New York.

SOILS.

Yates County is situated near the northern border of the Allegheny Plateau. This entire region was completely covered by ice during the glacial period, resulting not only in modification of the topography, but also in the deposition of a new layer of soil material from which the existing soils have been developed since the close of the glacial period.

Almost the entire region is underlain by rocks of Devonian age, the light-colored shale and sandstone of the Chemung and Portage groups. The Onondaga and Tully limestones outcrop to the north of this county, and small exposures occur throughout the northern part of the county, mainly in the deeply cut ravines.

The glacial till represented in the ground moraine mantling the uplands usually bears a close relation to the rocks over which it lies. In the lower part of the county, where the rocks are light gray in color, the soils are light colored. The stones have very largely come from the local bedrock. The glacial debris overlying the northern and northeastern parts of the county consists of a relatively deep deposit of till which carries a considerable proportion of limestone, brought largely from farther north.

The alluvial deposits in different parts of the county vary according to the source of their material and to the drainage conditions. Where the glacial streams flowed from sandstone and shale regions the soil material is brown to yellow in color, and the gravel consists of sandstone and shale. Where the streams flowed from regions of limestone debris the soil is dark brown in color and carries a considerable percentage of limestone fragments. The recently deposited

alluvium is brown or dark brown to gray or black in color, the shade depending upon the organic content.

The soils of Yates County are classed in 10 series. The individual types having a common origin and similar color, topography, and drainage characteristics are grouped in series, the members of which differ mainly in texture. The upland till soils are classed in the Ontario, Wooster, Volusia, Allis, and Lordstown series; the soils derived from fine lake sediments in the Schoharie series; the soils from terrace and other old stream or delta deposits, now lying above overflow, in the Chenango series; and the first-bottom soils in the Holly, Genesee, and Papakating series.

The Ontario series includes soils that are brown in the surface layer and have yellowish-brown or yellowish subsoil, somewhat compact but little if any heavier than the soil in texture. This series is derived from unassorted glacial deposits where a large proportion of the material is of limestone origin. Usually the substratum is distinctly calcareous, and fragments of limestone occur through the soil section. The topography is rolling and the drainage is good.

The Wooster soils are brown to grayish brown, with a yellowish tinge. The subsoils are yellowish brown. The series is derived from noncalcareous till consisting very largely of sandstone and shale material. The subsoils are no heavier than the soils in texture and are usually only slightly compacted. The substratum is distinctly porous, affording good underdrainage. The surface is rolling or very irregular and choppy.

The surface soils of the Volusia series are brownish gray to yellow, and the subsoils are pale yellow to gray, with mottlings of yellow and brown. The surface soil is friable, but the subsoil is compact and poorly oxidized. The entire 3-foot section is uniformly free from calcareous material. The Volusia soils are poorly drained.

The soils of the Allis series have been weathered from glacial till derived from local shales and sandstones. The surface soils are light colored. The subsoil is heavily mottled and rests upon bedrock at depths varying from 18 inches to 3 feet. The Allis series differs from the Volusia mainly in the thickness of the deposit.

The surface soils of the Lordstown series are light brownish yellow, and the subsoils are light yellowish brown. The material is loose and open and free from mottling. The soils have been derived from light-colored, noncalcareous shales and sandstones laid down as a relatively thin morainic deposit. The topography is rolling to hilly.

The Schoharie series includes types having yellowish-brown to brown surface soils and brownish subsoils, which may be mottled with shades of brown, red, and gray. The subsoils are as heavy as, or heavier than, the soil in texture, and calcareous. The topography

is nearly level to rolling and the drainage is good. These soils are derived from sedimentary material laid down in glacial lakes or the valleys of ancient streams, the material being of mixed origin.

The Chenango series includes types with light-brown, friable surface soils and lighter brown to yellowish-brown subsoils, underlain by stratified beds of sand and gravel. The material has been derived largely from noncalcareous sandstones and shales. The Chenango soils are well drained, and occupy second-bottom positions along old glacial streams or present watercourses.

The Holly series is characterized by gray surface soils and mottled gray and drab subsoils. The upper section is usually friable and the subsoil compact. The material consists of old, deep alluvium derived from light-colored shales and sandstones and laid down on terraces.

The surface soils of the Genesee series are brown, with light-brown subsoils. The drainage is only fair. These soils occupy alluvial plains along streams, and are subject to overflow. The material has been derived from local sandstone formations.

The Papakating series is characterized by very dark brown to black surface soils and mottled subsoils. The material has been derived from the sandstone and shale uplands and laid down as alluvium in relatively quiet water. The drainage is very poor.

Muck consists mainly of an accumulation of organic matter laid down and decomposed under poor drainage conditions.

Rough stony land includes steep slopes along ravines where the soil-forming material is subject to variation from season to season or where the rock formations are free from any soil covering.

The following table gives the name and the actual and relative extent of each soil type mapped in Yates County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Ontario loam	43,264		Lordstown silt loam	3,392	1.5
Smooth phase	1,664	20.9	Rough stony land	2,368	1.1
Shallow phase	896		Allis silt loam	1,984	.9
Volusia silt loam	34,880	17.7	Ontario gravelly fine sandy loam	1,664	.8
Flat phase	3,968		Volusia silty clay loam	1,024	.5
Lordstown stony silt loam	26,560	12.1	Chenango gravelly fine sandy loam	896	.4
Volusia stony silt loam	18,880	8.6	Papakating silty clay loam	896	.4
Wooster silt loam	15,552	7.1	Wooster fine sand	768	.3
Wooster gravelly silt loam	12,992	5.9	Papakating silt loam	704	.3
Wooster stony silt loam	12,672	5.8	Chenango fine sandy loam	640	.3
Ontario fine sandy loam	12,608	5.7	Holly silt loam	320	.1
Chenango gravelly silt loam	7,232	3.3			
Muck	5,184	2.4			
Schoharie silty clay	4,736	2.2			
Genesee silt loam	3,776	1.7	Total	219,520	

ONTARIO GRAVELLY FINE SANDY LOAM.

The surface soil of the Ontario gravelly fine sandy loam consists of 6 or 8 inches of brown fine sandy loam, carrying a moderate amount of rounded and angular gravel and stones of limestone and sandstone. The subsoil, to 36 inches, is a light-brown, gravelly, medium fine sandy loam. The lower section in places shows some stratification and cross-bedding.

This type occurs, in association with other limestone soils, in the towns of Potter, Jerusalem, Benton, Torrey, and Milo. The topography varies from rolling to rough, and is typical of kame deposits. The drainage is thorough and in some places excessive.

Approximately 75 per cent of this type is under cultivation to the general farm crops. Corn yields 25 to 35 bushels per acre, beans 10 to 18 bushels, wheat 20 to 25 bushels, and clover and timothy 1½ to 2 tons per acre. Apples and grapes do well.

Agricultural conditions are fairly good on this type. Valuations range from $75 to $125 an acre for the improved areas.

ONTARIO FINE SANDY LOAM.

The Ontario fine sandy loam to a depth of 8 or 10 inches consists of a brown fine sandy loam carrying a small percentage of both waterworn and angular fragments of sandstone and limestone. The subsoil, to 36 inches, is a light-brown to yellowish-brown fine sandy loam, containing bowlders very largely of limestone. The surface soil is mellow and open, while the subsoil is relatively compact, though thoroughly oxidized. The texture of this type as mapped varies from a fine sandy loam to a very fine sandy loam or light loam.

The Ontario fine sandy loam occurs in the northeastern part of the county, the largest areas being mapped in the towns of Benton, Torrey, and Potter. It occupies ridges along slopes and at the heads of valleys. The topography varies from undulating to rolling, ranging to rough and morainic. The natural drainage is usually adequate. Much of the type has been underdrained. The compact subsoil tends to store sufficient quantities of moisture for the best plant development.

This soil was originally forested with a heavy stand of black walnut, chestnut, oak, and other hardwoods. This has been cleared off, and about 80 per cent of the type is under cultivation at the present time. The most important crops grown are corn, beans, cabbage, wheat, oats, and fruit. Corn yields 35 to 60 bushels per acre and a good tonnage of stover. Beans do well, yielding 18 to 20 bushels per acre. The soil is particularly well adapted to the growing of winter wheat, which yields 25 to 40 bushels per acre. Oats also do well,

yields of 45 to 50 bushels per acre being reported. Cabbage is an important cash crop, yielding 18 to 20 tons per acre. A small acreage is devoted to grapes. Apples, plums, pears, peaches, and cherries are extensively grown. The roughest areas are best suited to forestry.

This soil is handled in much the same way as the Ontario loam. Only a small quantity of stock is kept, usually consisting of a few cows, a small flock of sheep, a few hogs, and the necessary work horses.

Agricultural conditions in general are good on the Ontario fine sandy loam. The buildings are modern and commodious, and the fields are well fenced. Land values range from $75 to $200 an acre. Very few farms are changing hands.

ONTARIO LOAM.

The Ontario loam to a depth of 8 or 9 inches is brown in color and a friable, light loam to heavy fine sandy loam in texture. It usually contains a moderate quantity of relatively small, angular fragments of sandstone and limestone. The subsoil to a depth of 36 inches is lighter in color than the surface soil, being brown to light brown or yellowish brown. It consists of a loam which usually is noticeably more compact than the surface soil, but varies somewhat, from heavy to light. The subsoil contains many angular and partially rounded stones and gravel of sandstone and limestone, among which limestone usually predominates. Much of this soil type carries a high percentage of limestone fragments, and is closely related to the soils mapped as Honeoye in the eastern part of the State.

Variations in texture occur in this type in the large areas bordering Seneca Lake 2 miles south of Dresden, where the soil in numerous patches varying in size from a few square feet to two or three acres ranges in texture from a fine sandy loam to silty clay. The soil usually consists of 4 to 12 inches of light-brown, light-textured loam underlain by heavy, plastic, chocolate-colored silty clay or clay. The surface soil carries a moderate amount of sandstone fragments, and the subsoil contains varying quantities of limestone fragments of all sizes.

The Ontario loam is one of the most important soil types in this region. It is extensively developed in a belt extending across the northern part of the county, especially in the towns of Milo, Torrey, Benton, Potter, and Middlesex. The surface is undulating to gently rolling, sometimes varying to low, elongated hills or ridges with rounded slopes. Near Penn Yan the type extends to some of the steep slopes. There is no difficulty in using farm machinery except on the steepest slopes. Natural drainage over this type is prevailingly only

fair, owing principally to the compactness of the lower subsoil. It is estimated that more than 75 per cent of the type has been tile-drained.

Agricultural conditions on the Ontario loam are above the average for the State. Eighty to ninety per cent of this soil type is cleared and under cultivation. The original timber consisted of black walnut, red oak, and white pine. Canadian and Kentucky bluegrass grow naturally and form the chief part of the older sods.

The most important crops grown are corn, beans, wheat, oats, and hay. Apples are the principal fruit, with smaller acreages devoted to pears, plums, and peaches. Corn is grown mainly for the grain, and yields 35 to 60 bushels per acre, with an average of about 40 bushels. The red kidney bean is generally grown on this soil, and yields 15 to 20 bushels per acre. The soil is well adapted to wheat, of which a large acreage is sown annually. Yields range from 25 to 35 bushels per acre. Oats yield 35 to 60 bushels per acre. Hay is an important crop on this soil. The first season clover usually cuts 2 tons or more per acre, and the second year a good quality of timothy and clover mixed yields 1½ to 2 tons per acre. Some cabbage is grown, yielding 15 to 20 tons per acre. The acreage devoted to alfalfa is being extended. Most of the steeply sloping areas along Keuka Lake are used for the production of grapes.

This is one of the best farmed soils in the county. Most of it has been improved by underdrainage, and systematic rotations are practiced. A common rotation consists of corn or beans the first year, followed by beans, cabbage, or oats the second year, and wheat, clover, and timothy seeded the third year. The sod is left for 2 years. Stable manure is applied to sod to be plowed for corn, and small quantities of commercial fertilizer are used on cabbage and wheat.

Land values on the Ontario loam depend largely upon the location, state of cultivation, fruit plantings, and buildings. Very few farms are for sale for less than $100 an acre, and most of them are held at $125 to $200 an acre. The roughest areas used for pasture are valued at $10 to $30 an acre, the areas in timber at $25 to $60 an acre, and grape lands at $150 to $300 an acre.

Ontario loam, smooth phase.—The smooth phase of the Ontario loam consists of a brown to dark-brown loam, with a depth of 6 to 10 inches, underlain by a subsoil of light-brown to yellowish-brown, compact loam. A small quantity of limestone and sandstone fragments occurs on the surface and throughout the soil section. Occasional glacial bowlders of rocks foreign to this region are scattered over the surface. The surface soil is uniformly darker and more silty than that of the typical Ontario loam.

The smooth phase occurs throughout the more gently undulating region in the northeastern part of the county, principally in the

towns of Torrey and Benton. It is developed along stream heads and in depressions where drainage is slow or entirely lacking.

The phase is not extensive, and it is of little importance. Only a very small percentage is under cultivation, the remainder being used as pasture or woodland. The timber growth consists of soft maple, elm, and white ash. In its present condition the phase is probably being utilized to the best advantage.

Ontario loam, shallow phase.—The shallow phase of the Ontario loam has a brown, light loam surface soil, of an average depth of 8 inches, underlain by light-brown or yellowish-brown, compact loam, which rests upon bedrock of fine-grained sandstone and shale at depths varying from 18 inches to 3 feet. In the surface soil small angular sandstone fragments predominate, but in the subsoil most of the fragments are of limestone.

This phase is encountered in the towns of Benton and Torrey, and occurs where the uplands break into the slope to Seneca Lake. The surface is usually undulating, with a moderate slope. The surface drainage is fairly well developed, but the internal movement of moisture is poor, owing to the compact structure and the nearness to bedrock. Crops often suffer during protracted periods of rain or drought.

Agriculture is fairly well developed in this phase. Practically the same crops are grown as on the deeper soils, but the yields are slightly lower.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Ontario loam:

Mechanical analyses of Ontario loam.

Number.	Description.	Fine gravel	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
162447	Soil	2.0	4.0	3.3	19.4	22.6	34.1	14.5
162448	Subsoil	1.8	3.7	3.3	20.0	22.8	28.1	20.2

WOOSTER STONY SILT LOAM.

The Wooster stony silt loam consists of 5 or 7 inches of brown to light-brown mellow, stony silt loam, underlain to 36 inches or more by a yellowish-brown to yellow, stony silt loam. The entire 3-foot section is friable and well oxidized. Both soil and subsoil carry a variable but usually large quantity of small, angular, flat fragments of sandstone and a few large bowlders of foreign origin. In places the soil approaches a loam in texture, containing much fine sand and very fine sand.

The Wooster stony silt loam occurs in the more rolling and rougher areas throughout the uplands. It is typically developed in the towns of Jerusalem, Italy, and Potter, and in smaller areas in other towns. The topography is rolling to hilly, and fields are cut up by the relatively deep channels of small intermittent streams. Part of the type includes rough, morainic areas. The drainage is usually good.

The original forest growth on this soil has practically all been removed. It consisted chiefly of white pine, oak, chestnut, and hard maple. The present stand consists of second and third growth oak, maple, chestnut, and white pine. Approximately 60 per cent of the type is in timber or permanent pasture. Agricultural conditions are only fair over most of the Wooster stony silt loam. Oats, buckwheat, hay, and beans are the principal crops grown. Dairying is carried on in a small way. A considerable number of sheep and a few hogs are raised.

Oats yield 20 to 35 bushels per acre; buckwheat, 15 to 20 bushels; hay, 1 ton; beans, 10 to 16 bushels; and potatoes, 125 to 150 bushels per acre. Fields are often left in sod too long, resulting in decreased productiveness of the soil and a lowering in the quality of the hay. Very little commercial fertilizer is used on this soil.

Land values vary widely on the Wooster stony silt loam. Farms with buildings in good condition and fields in fair cultivation, with little waste land, sell for $75 to $90 an acre, but much of the type can be bought at lower prices.

Farms on this soil can be greatly improved by keeping more live stock and selling less hay. Systematic, shorter rotations should be followed and some form of lime should be used. Many of the farm woodlots could be improved and put on a paying basis by cutting out the dead timber and less desirable undergrowth.

WOOSTER GRAVELLY SILT LOAM.

The Wooster gravelly silt loam consists of a light-brown to dark yellowish brown gravelly silt loam, 6 or 8 inches deep, resting upon a subsoil of brownish-yellow gravelly silt loam, 36 inches or more in depth. The whole 3-foot section is more or less filled with water-worn, rounded, and flat, angular fragments of sandstone and other calcareous rocks.

The texture and the percentage of gravel from place to place are variable. The soil in many places grades toward a loam or even a fine sandy loam. In one small area three-fourths of a mile northwest of Guyunoga and another 2 miles southwest of Italy the soil is distinctly sandy, consisting of a brown gravelly fine sandy loam underlain by a yellowish-brown gravelly fine sandy loam.

The Wooster gravelly silt loam occurs in areas of relatively rough morainic deposits through the valleys and to a less extent in the

uplands. It is most extensively and typically developed in the southwest corner of Italy Town. Smaller areas are mapped in every town in the county except Torrey. The topography varies from rolling to hummocky and ridgy. In many places the surface is marked with small kettleholes. The drainage is good to excessive. The slope is sufficient to cause adequate run-off, and the deep semi-stratified substratum gives thorough underdrainage.

Approximately 50 per cent of this type is under cultivation. It is devoted to general farm crops, and apples, grapes, and small fruits. Yields vary with the topography and methods of cultivation. Beans yield 10 to 15 bushels per acre, potatoes 125 to 150 bushels, oats 25 to 50 bushels, and hay 1 to 1½ tons.

WOOSTER FINE SAND.

The Wooster fine sand to a depth of about 6 inches consists of a light-brown to yellowish-brown very fine sand or loamy fine sand. The subsoil, to 36 inches, is a yellowish-brown to dull-yellow fine sand. The texture of the type tends toward a very fine sand rather than a medium sand.

The Wooster fine sand is not extensive in Yates County. The largest area occurs immediately southeast of Friend. Smaller areas occur, in conjunction with types derived from limestone drift, in the towns of Potter and Benton. The topography is rolling to rough and hummocky, and drainage is apt to be excessive.

The smoother areas of this type are under cultivation to corn, oats, wheat, and hay. Truck crops are grown to some extent and give fair yields.

Land values vary according to the location with respect to markets, the topography, and the state of cultivation.

Cultivated fields on the Wooster fine sand should be so cropped as to increase the supply of organic matter, giving the soil greater power to conserve moisture and improving the tilth.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Wooster fine sand:

Mechanical analyses of Wooster fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
162451	Soil	2.5	6.5	6.1	37.0	28.5	13.6	5.7
162452	Subsoil	1.8	4.9	4.0	37.5	35.5	11.4	4.8

WOOSTER SILT LOAM.

The surface soil of the Wooster silt loam consists of 7 or 8 inches of friable silt loam, deep brown or yellowish brown when moist. The subsoil, to a depth of 36 inches, is a more compact, though well-

oxidized, yellowish-brown silt loam. The entire 3-foot section is free from mottling, in contrast to the Volusia soils. A small quantity of angular sandstone fragments and occasional glacial erratics are scattered over the surface and throughout the subsoil. In places the texture varies toward a loam.

The Wooster silt loam is extensively developed throughout the uplands, occurring in areas of deep till derived from sandstone and shale. It ranges in elevation from 800 to 1,800 feet above sea level. The type is mapped in every township in the county except Torrey. The most extensive areas occur in Starkey, Milo, Jerusalem, and Potter towns.

The topography varies from undulating to rolling. Practically all the Wooster silt loam can be worked with machinery. The natural slope and open structure of the soil and subsoil permit thorough drainage. A few areas deficient in natural drainage have been tile-drained.

This soil was originally covered with a heavy stand of white pine, oak, and chestnut. The present forests are of second and third growth, principally oak, chestnut, and maple. Canada bluegrass predominates in the meadows.

Agricultural conditions on this soil are in general good. The farms range from among the best in the county to the poorest. Approximately 75 per cent of the type is under cultivation. Corn, oats, wheat, buckwheat, beans, and hay are the principal crops. Dairy farming is carried on to some extent. The milk is usually made into butter on the farm. Many sheep and a few steers are kept.

Corn for grain does well in areas at the lower elevations, yielding 30 to 45 bushels, or 8 to 12 tons of ensilage, per acre. Oats ordinarily yield about 35 bushels per acre, wheat 20 to 25 bushels, buckwheat 25 to 35 bushels, beans 12 to 18 bushels, and hay about 1 ton. Alfalfa is grown with success on some farms. Potatoes do well, yielding 150 to 200 bushels per acre. Apples and small fruits give good yields. Some very successful vineyards have been established in the vicinity of Branchport.

A rotation in common use consists of corn or beans the first year; oats, beans, or potatoes the second year; and wheat, with timothy and clover seeded, the third year. The sod is left two years or more. Stable manure is usually applied to sod to be used for corn, and commercial fertilizers are applied on corn and wheat. Modern machinery is generally used on this type.

Land values on the Wooster silt loam are relatively high, ranging from $45 to $125 an acre. Probably most of the type is held at $75 to $90 an acre.

Agricultural conditions on the Wooster silt loam could be improved by raising more cattle and sheep. The soil could be made more productive by the application of some form of ground limestone at least once in every rotation.

VOLUSIA STONY SILT LOAM.

The Volusia stony silt loam to a depth of 6 to 8 inches is a light-yellow to grayish-brown, stony silt loam. The subsoil, to 36 inches, is a light-yellow to gray, compact stony silt loam, mottled with orange, yellow, and brown. Stones are comparatively abundant on the surface and throughout the 3-foot section. They consist of fine-grained sandstone, and vary in size from small angular chips to slabs 6 or 12 inches across. There is sufficient stone to interfere to a greater or less extent with the best use of farm machinery.

This type is widely distributed throughout the upland, but it occurs principally in the high, rolling country throughout the towns of Starkey, Barrington, Jerusalem, Italy, Middlesex, and Potter. The surface is rolling to hilly, but most of the type can be worked with farm machinery. The close, dense structure of the subsoil prevents free internal movement of soil moisture, and the type as a whole is inadequately drained.

The Volusia stony silt loam was originally timbered with maple, beech, white pine, birch, and wild cherry. This has largely been cut over, and the present wooded areas support a poor growth of the same trees. Some of the cultivated areas have been partially abandoned, and are covered with briers, goldenrod, and other weeds.

Farms on this soil are devoted to general farming. Hay is the principal crop. Small numbers of cattle and sheep roam the fields at will. Many of the farms are run down, the buildings being in poor condition, many of the fences being entirely gone, and the fields grown up in weeds and briers. A few farms are in a fair state of cultivation and on these the principal crops grown are hay, oats, buckwheat, and beans. Hay yields one-half to 1½ tons per acre, oats 25 to 30 bushels, buckwheat 18 to 25 bushels, and yellow-eye beans 10 or 12 bushels. Most of the hay and all the beans produced are sold.

Farms on this soil could be improved by installing better drainage, applying lime, rotating crops, and raising more live stock.

VOLUSIA SILT LOAM.

The surface soil of the Volusia silt loam is a friable, brownish-gray silt loam, 6 to 8 inches deep. The subsoil, to a depth of 36 inches, is a light-yellow to grayish-brown, compact silt loam. The

subsoil is always mottled with brown, yellow, drab, or gray, the intensity of mottling varying from place to place. Both soil and subsoil contain a moderate amount of relatively small angular fragments of sandstone and shale, as well as a few large glacial bowlders of foreign origin. Some included small areas, mostly of rough topography, really represent the stony silt loam.

The Volusia silt loam is extensively developed throughout the uplands underlain by sandstone and shale. It has a range in elevation of over 1,300 feet within the county. The largest areas are encountered in the townships of Barrington and Jerusalem, but the type is developed to some extent in every township in the county.

The surface is undulating to rolling, with relatively smooth slopes. Farm machinery can be used on practically all the type. The surface drainage is fair, but the compact subsoil holds moisture, and the type as a whole is poorly drained. Artificial drainage is necessary over a large proportion of its area.

The original timber growth on this soil consisted of sugar maple, beech, white pine, basswood, and ash. Practically all the virgin stand has been removed. Large areas were cleared, cultivated for a few years, and then abandoned. These areas afford some scant pasturage at present.

The Volusia silt loam is devoted to general farming, dairying, and sheep husbandry. It supports a large number of small orchards and vineyards, only a few of which receive any tillage throughout the season. Probably the most important crop grown is hay, largely timothy and redtop. Yields range from one-half to 1½ tons per acre, according to the age and condition of the sod. Some alsike clover, which does best on a wet, acid soil, is grown. Buckwheat yields 20 to 25 bushels per acre, oats 25 to 35 bushels, and beans of the yellow-eye variety 10 to 18 bushels.

A small number of cattle are kept, the milk being made into butter at home or taken to a factory.

Only a very small proportion of the Volusia silt loam is handled in a systematic, profitable manner. In many cases crops are grown to which the soil is not adapted. No systematic rotation of crops is practiced, and the tillage methods are inefficient. Sods are left until they no longer produce, and many fields have been allowed to grow up to briers and weeds. The buildings are generally run down, and fences are often lacking. Very little live stock is kept, and most of the hay is sold, with the result that the organic matter in the soil has been, or is being, largely depleted. This is the so-called "abandoned-farm" soil of southern New York.

Land values on this type range from $15 to $100 an acre. The lowest priced land is usually quite remote from good highways and lacks buildings. The higher valuations prevail in areas contiguous to better soil.

To improve the Volusia silt loam it is necessary to build up the organic content of the soil by rotating crops and keeping more live stock. The soil needs better drainage, and its productiveness could be increased by the use of lime and thorough cultivation.

Volusia silt loam, flat phase.—The surface soil of the flat phase of the Volusia silt loam is a light yellowish brown to yellowish-gray, mellow silt loam, with an average depth of 6 or 8 inches. The subsoil from 8 to 24 inches is a light-yellow to dull-gray, compact silt loam, invariably mottled with yellow and brown. From 24 to 36 inches or more the material is a gray or drab silty clay loam, heavily mottled. There is usually a small percentage of angular and partially rounded fragments of local sandstone and foreign bowlders scattered over the surface and throughout the 3-foot section.

This phase occurs in the southern part of the county. The largest area is mapped north of Himrod. Smaller areas are scattered throughout the county. The surface is undulating to nearly level, with occasional ridges lying 2 or 3 feet above the surrounding land. Natural drainage is poor, owing to the slight slope and the heavy character of the subsoil.

The flat phase of the Volusia silt loam is not important agriculturally. Approximately 60 per cent of it is used for permanent pasture or is thinly covered with elm, soft maple, beech, and ash. Areas under cultivation are devoted to oats, corn, buckwheat, and hay. Land values range from $10 to $75 an acre. This soil requires artificial drainage and the addition of some form of lime. It seems to be best suited to the production of hay and to use as pasture land.

VOLUSIA SILTY CLAY LOAM.

The Volusia silty clay loam has a surface soil of about 6 inches of grayish-brown to yellowish-brown, heavy silt loam or silty clay loam. The subsoil is a dense, compact silty clay, pale yellow to gray in color and mottled with brown and yellow. A few small angular fragments of sandstone and foreign rocks are scattered over the surface and throughout the soil mass.

The largest area of this type occurs about 3 miles north of Himrod. Smaller areas are mapped throughout the uplands, especially in the towns of Starkey, Barrington, Milo, and Jerusalem. Owing to the gently undulating to nearly level surface and the compact internal structure the type does not have adequate drainage.

This is not an important type agriculturally. Part of it supports a poor stand of elm, basswood, and soft maple. The type is largely used as pasture and hay land. Buckwheat and beans are grown in a small way. Hay is probably the crop best suited to the soil, the yields ranging from three-fourths ton to 1½ tons per acre.

Agricultural conditions over the Volusia silty clay loam in Yates County are poor and land valuations apparently are disproportionately high. The type requires drainage and the liberal use of lime for successful farming.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Volusia silty clay loam:

Mechanical analyses of Volusia silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
162421	Soil	1.7	3.0	1.3	4.3	8.6	50.4	30.6
162422	Subsoil	.7	1.4	.6	2.3	9.6	47.6	37.8

ALLIS SILT LOAM.

The surface soil of the Allis silt loam is a light yellowish brown, mellow silt loam, 4 to 6 inches in depth, overlying a subsoil of light-yellow to gray silt loam which rests at depths of 15 to 24 inches upon fine-grained sandstone. The subsoil is invariably mottled with brown, yellow, or gray. In general both soil and subsoil contain only a moderate quantity of small angular stone fragments, but in a few areas the type is quite stony. These stony areas are shown on the map by symbol.

The Allis silt loam is most extensively and typically developed in the town of Milo, with smaller areas in the towns of Jerusalem and Middlesex. It occurs as partially residual glacial till overlying non-calcareous shale and standstone at shallow depths.

The topography is rolling to hilly. The large area east of Himrod has a gentle slope toward the lake. The small area in the northwest corner of the town of Middlesex occupies a very steep slope.

The natural drainage in general is inadequate. The slope is usually sufficient to insure good run-off, but the heavy subsoil and the shallowness of the soil mantle, with springs seeping out along the bedding planes of the rock, render the type wet and cold during much of the year unless underdrained.

Practically all of the Allis silt loam has been cleared. A small proportion is grown up to a poor stand of scrub timber and brush. A larger percentage is used as pasture or hay land. The area bordering Seneca Lake is devoted to general farming and fruit production. Grapes and berries do well where the soil has been improved by underdrainage. Agricultural conditions on this soil range from fair to poor. Land values depend upon the location, state of cultivation, and the value of adjoining property.

LORDSTOWN STONY SILT LOAM.

To an average depth of 6 inches the surface soil of the Lordstown stony silt loam is a light-brown to yellowish-brown, stony silt loam. The subsoil is a yellowish-brown to yellow, stony silt loam. This is essentially a shallow-till soil, the depth of the till mantle varying from 12 inches to as much as 4 or 5 feet. This type is characterized by a high stone content both in the surface layer and throughout the soil mass. The stones are usually small; they do not seriously interfere with cultivation. The boundary drawn between the deeper areas of the Lordstown soil and the shallower areas of the Wooster soils is necessarily arbitrary.

The Lordstown stony silt loam occurs bordering the narrow, deep valleys throughout the uplands. Its greatest development is along Canandaigua, Seneca, and Keuka Lakes and along the glacial valleys extending through Middlesex and Italy Hollow; also along the Big Stream Valley and its tributaries in the southeastern part of the county. The slopes are all steep, some of them having a grade of 800 to 1,000 feet to the mile. Farm machinery can be used in few places with any satisfaction. In the vineyards sleds are used to move the fruit down the slopes. Drainage is often excessive, owing to the open structure of the soil and the steepness of the slopes.

Most of the original growth of chestnut, oak, white pine, and maple has been removed. A large proportion of the type is now covered with a mixed second or third growth of maple, pine, hemlock, oak, and similar trees, usually of low quality. Part of the type that was cleared and cultivated has been abandoned and now supports a growth of brush and weeds.

Along Keuka Lake, and to a less extent along Canandaigua Lake, the Lordstown stony silt loam is used principally for viticulture. The climatic conditions here are most favorable to grape culture. The more important varieties grown are the Concord, Delaware, and Catawba. Yields range from 2 to 3 tons per acre, depending upon the variety, the season, and the condition of the vines. The vineyards usually receive thorough cultivation throughout the growing season, but in a few cases cover crops are grown. Some farmers use commercial fertilizers and others stable manure, while many do not use any fertilizer.

LORDSTOWN SILT LOAM.

The surface soil of the Lordstown silt loam is a light-brown mellow silt loam of an average depth of 6 or 8 inches. The subsoil is a yellowish-brown to bright brownish yellow friable silt loam, resting upon sandstone and shale bedrock or masses of shattered rock at shallow depths, usually less than 3 feet. The entire 3-foot

section usually contains a small percentage of small angular fragments of sandstone.

The Lordstown silt loam is not an extensive soil in Yates County. It occurs in the towns of Starkey, Milo, Torrey, Jerusalem, and Barrington. The largest areas are mapped north of Shannon Corners and south of Dresden, in the eastern part of the county. The surface is undulating to rolling, with few slopes too steep for cultivation. The run-off is good, and the mellow surface soil and relatively open subsoil permit of free internal movement of moisture.

Originally a heavy forest of white pine, oak, chestnut, and maple covered this soil. This has largely been cleared off and the land put into cultivation. Corn, beans, oats, wheat, buckwheat, and hay are the principal crops grown. Grapes, raspberries, apples, plums, pears, and cherries are grown to some extent and give fair yields. A few head of cattle, sheep, and hogs are kept on nearly every farm.

Corn yields 25 to 35 bushels per acre, beans 10 to 12 bushels, oats 25 to 45 bushels, wheat 20 to 25 bushels, buckwheat 20 to 25 bushels, and mixed hay 1 to 1¼ tons. The soil is handled in about the same manner as the adjacent types. Some sort of a rotation is practiced more or less systematically. The hay lands are mowed for three to five years. Very little, if any, lime is used, and only a small amount of commercial fertilizer is applied on beans and wheat. Beans, wheat, and hay are the main cash crops. Some butter is made on the farm and sold on the local markets.

Land values on the Lordstown silt loam vary according to the location, the state of cultivation, and the acreage of fruit in bearing. From $35 to $100 an acre is asked for farms on this soil. Few farms are changing hands.

Agricultural conditions prevailing over this soil are only fair to poor. The buildings are in a fair state of repair, but the fences are poor. Fields are left in sod too long, resulting in a poor quality of hay and in a decrease in yields. This soil in general needs more organic matter, which can be added by plowing under stable manure or cover crops or by turning under a good sod. Liming should prove beneficial. The more extensive raising of live stock, to consume roughage from the crops, would apparently be profitable.

SCHOHARIE SILTY CLAY.

The Schoharie silty clay, to a depth of 6 or 8 inches, is a brown to grayish-brown, heavy silt loam to silty clay. The subsoil to 36 inches is a heavy, tenacious silty clay, of a brown to light chocolate brown color. Small fragments of glacial erratics and of sandstone and limestone are often scattered over the surface and occasional fragments may be found in the soil section. In some places the

loamy soil layer is lacking, the entire 3-foot section being a heavy clay in texture. In a few areas the soil rests upon shale at depths of 20 inches to 3 feet.

The Schoharie silty clay is most extensively and typically developed east of the New York Central Railroad, in the vicinity of Himrod. Smaller areas are mapped along Seneca Lake north of Dresden, and in the vicinity of Keuka Park, and in other sections of the upland, in association with the limestone-till soils.

The surface is undulating to gently rolling, the areas often being cut through by narrow ravines traversed by small streams. The substratum in such cuts is seen to be largely made up of massive limestone bowlders. The subsoil at depths of 2 feet or more usually gives a calcareous reaction.

The gently undulating topography and the fine texture and dense structure of the soil retard the free movement of water, and the type consequently is rather cold and poorly drained. Much of it has been improved with tile drainage.

A large proportion of the Schoharie silty clay is under cultivation. Corn, oats, wheat, and hay are the principal crops grown. Corn yields 35 to 50 bushels per acre, oats 30 to 50 bushels, wheat 20 to 25 bushels, and hay 1½ to 2 tons. There are some thriving fields of alfalfa on this soil, and the question of drainage is the only limiting factor in the growing of this legume. Some apples and grapes are grown, with fairly good success.

Agricultural conditions over the Schoharie silty clay are only fair. Land values range from $60 to $100 or more an acre, varying with the location and the acreage devoted to fruit. Very few farms are changing hands.

CHENANGO GRAVELLY FINE SANDY LOAM.

The Chenango gravelly fine sandy loam to a depth of 6 to 8 inches is a light-brown to brown, gravelly fine sandy loam. To a depth of 36 inches the subsoil is a light-brown to yellowish-brown, gravelly fine sandy loam. Where typically developed the type contains 15 to 35 per cent of small, rounded gravel and angular fragments of sandstone and foreign rocks on the surface and throughout the entire 3-foot section. The interstitial material varies from a fine sandy loam to a medium sand. In some areas gravel may be lacking, but these are included on account of their small extent.

The Chenango gravelly fine sandy loam occurs in small scattered areas along Big Stream, 2 miles north of Penn Yan, and in other parts of the county. Its surface is nearly level, the type occupying terraces or benches, but it is well drained. In the area at Dresden the soil differs from typical in carrying a considerable proportion

of limestone gravel. It is really the Fox silt loam, but it is not extensive enough to recognize as a separate type.

The Chenango gravelly fine sandy loam was originally forested with white pine, chestnut, oak, and hemlock. This has been cleared off, and the soil is cultivated to general farm crops. In a few areas it is low in organic matter.

Agriculture is well developed on this soil. Corn, oats, wheat, beans, alfalfa, and hay are grown with success. The type is well suited to the production of fruits, especially apples, pears, raspberries, and strawberries.

Land values on this soil vary with the location, accessibility to markets, condition of buildings, extent of tillable land, and state of cultivation.

CHENANGO GRAVELLY SILT LOAM.

To a depth of 8 inches the Chenango gravelly silt loam is a light-brown to light yellowish brown, gravelly silt loam. The subsoil, to a depth of 36 inches or more, is a yellow, gravelly silt loam. In places the texture ranges to coarse. The gravel consists of both waterworn and angular fragments of sandstone and shale. In some places the type contains cobbles. Below the 3-foot section the material consists of stratified beds of sand, silt, and gravel. The area immediately west of Himrod, extending in a southerly direction, contains a larger percentage of small, partially weathered fragments of light-colored shale on the surface and throughout the entire 3-foot section. In some small areas the type varies in having a very dark brown surface soil and a lighter colored subsoil. Other areas usually occurring at the mouths of small streams issuing from the uplands are both gravelly and stony, large fragments of sandstone and shale being abundant on the surface and throughout the soil section.

The Chenango gravelly silt loam is comparatively extensive throughout the valleys in the sandstone region of Yates County. The largest area is a strip extending from Himrod southward through Dundee to Rock Stream. Smaller, though extensive, areas occur along most of the larger and some of the smaller streams of the county. The type occupies terraces and alluvial fans deposited at their mouths by swiftly moving streams of glacial times, and its surface is gently undulating to rolling. Owing to the mellow condition of the surface soil and the open structure of the subsoil, the drainage is good.

The original forest growth on this soil consisted of maple, white pine, hemlock, chestnut, and oak. This has largely been cut off and the soil brought under cultivation. Corn, beans, oats, and hay are the leading crops. Grapes, raspberries, strawberries, apples, pears, and plums are grown to a considerable extent. Dairying and sheep raising are carried on by some farmers.

Corn ordinarily yields 25 to 35 bushels per acre, beans 10 to 15 bushels, oats 30 to 35 bushels, and hay about 1 ton. All the fruits grown return good yields. The milk produced is either taken to creameries or made into butter on the farm.

Agricultural conditions on the Chenango gravelly silt loam are prevailingly good. Systematic crop rotations are usually practiced, the tillage is thorough, and the stable manure produced is generally returned to the soil. The vineyards and orchards receive careful attention in both cultivation and spraying. The buildings are adequate, and they are generally kept in good repair. Good fences are maintained.

Land values depend largely upon the location, the character of the adjacent soils, the state of cultivation, and the acreage devoted to fruit. Farms located principally on this type range in selling value from $45 to $100 an acre.

CHENANGO FINE SANDY LOAM.

The surface soil of the Chenango fine sandy loam is a light-brown fine sandy loam, with a depth of 7 to 9 inches. The subsoil to 36 inches is a yellowish-brown fine sandy loam. The entire 3-foot section is uniformly free from stone. Deposits of stratified clay are often discernible in road cuts, at depths ranging from 3 to 6 feet below the surface.

The Chenango fine sandy loam occurs in the southeastern corner of the county. It is of very small extent. The topography is gently undulating to rolling, with occasional ridges resembling the remains of cut-down terraces. The drainage ranges from good to rather excessive.

This type has largely been cleared and planted to apples, peaches, or grapes, or put under cultivation to general farm crops. Yields are about the same as those obtained on adjacent types.

HOLLY SILT LOAM.

The Holly silt loam consists of 6 or 8 inches of brownish-gray, mellow silt loam, underlain by a subsoil of gray or drab to yellowish-gray, heavy silt loam, invariably mottled with yellow and rusty brown. The lower subsoil from 30 to 36 inches is often a heavy, tenacious silty clay or clay. The surface and the entire 3-foot section are uniformly free from gravel and stone. Variations from the typical are encountered in small, poorly drained areas where the material approaches that of the Papakating types, or on low, narrow ridges where the 3-foot section is less mottled, the type here approaching the Chenango series in characteristics. These areas were too small to warrant separation on the map.

While the Holly silt loam is typically developed in Yates County it is not extensive, occurring only in the southern part of the county along Big Stream and Fivemile Creek, in the towns of Barrington and Jerusalem, respectively.

The surface ranges from very gently undulating to level. The type is an alluvial first-bottom soil, subject to overflow in seasons of high water. Very little deposition is going on at the present time, however. The drainage is naturally poor.

Practically all this type has been cleared, and it is used largely for pasturage. Hay is the most extensively grown and the most dependable crop. Occasionally oats, buckwheat, corn, and beans are grown, but the risk of loss during a wet season makes it impracticable to follow a systematic rotation. The hay produced is largely timothy and yields 1½ to 2½ tons per acre.

Land values vary widely on this type. Some farms are held at prices as low as $15 an acre, and some as high as $90 an acre.

In general, this soil needs underdrainage and applications of lime.

GENESEE SILT LOAM.

The Genesee silt loam to a depth of 8 or 10 inches is a brown to grayish-brown, mellow silt loam, underlain to a depth of 36 inches or more by a light-brown to grayish-brown, compact silt loam, mottled with yellow and rusty brown. The mottlings are more pronounced in the more poorly drained areas. A small percentage of rounded gravel and waterworn shale fragments is sometimes encountered on the surface and throughout the lower section, especially in the smaller areas. Some small scattered areas are quite shaly. The color of the surface soil is variable in some of the larger areas, depending upon the drainage and the organic-matter content.

The Genesee silt loam occurs in numerous areas scattered throughout Yates County, particularly along the bottoms north from Branchport and along Flint Creek, West River, Nettle Valley Creek, and smaller streams throughout the uplands. The surface is level to gently undulating. The type occurs in first-bottom positions where it is subject to overflow during periods of high water, and where it receives seepage from the bordering hills during part of the year. A small proportion of it is fairly well drained during at least part of the season.

This type was originally covered with ash, elm, soft maple, and pine. This has all been cut over several times, and the present tree growth is light and of poor quality. The soil is best adapted to use as hay and pasture land, and it is largely devoted to these uses. Sods are usually left for long periods and yield 1 to 2 or more tons of hay per acre.

PAPAKATING SILT LOAM.

The Papakating silt loam consists of a dark grayish brown to black silt loam, 4 to 10 inches deep, underlain to 3 feet or more by a grayish-brown to drab, heavy silt loam, mottled with brown and yellow. The type is relatively free from gravel and stones. In some places the surface soil is lighter colored than typical, the type here resembling the Genesee soils. In other places a layer of Muck 1 to 4 inches in thickness covers the surface.

The Papakating silt loam is not an extensive soil in Yates County. The largest area is mapped near Benton. Smaller areas occur in the towns of Benton and Milo. The type usually occupies first-bottom positions along streams, but a few areas are mapped in basin-like depressions throughout the upland. The surface is nearly level and drainage is uniformly poor.

A large proportion of this type is grown up to scrub timber and brush. Some of it is used for pasture. A very small percentage has been improved with internal drainage and is cultivated to general farm crops, principally beans, corn, cabbage, beets, grain, and hay.

PAPAKATING SILTY CLAY LOAM.

The surface soil of the Papakating silty clay loam is a dark-brown or dark grayish brown to black, heavy silt loam to silty clay loam, with an average depth of 5 to 7 inches. The subsoil is a grayish-brown to drab silty clay, usually mottled with yellow and dull brown. Scarcely any stone or gravel occurs in this type. Variations in the surface-soil color are due largely to differences in the organic-matter content.

The Papakating silty clay loam is most extensively developed in the western part of the county, along Flint Creek and West River and their tributaries. Smaller patches are scattered throughout the uplands. The surface is nearly flat, and most of the larger areas are wet during the greater part of the year. The flat surface and the heavy texture and impervious structure of the subsoil hinder the free circulation of soil moisture, and the type is poorly drained.

The timber growth on this soil consists principally of ash, elm, poplar, soft maple, and alder. In some places it supports a luxuriant growth of flags, sedges, rushes, and other water-loving plants. Some hay is cut from the drier areas, and some pasturage is obtained. In its present condition the agricultural value of this type is low, and very little of it is farmed. When drained it should produce good crops of hay and grain.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Papakating silty clay loam:

Mechanical analyses of Papakating silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
162405	Soil	0.1	1.4	1.3	8.1	4.9	52.4	31.0
162406	Subsoil	.0	.7	.9	6.0	7.2	52.0	33.2

MUCK.

Muck represents accumulations of more or less decayed organic matter in a very finely divided state, mixed with some mineral matter, and existing naturally under poor conditions of drainage. The depth of the Muck ranges from 6 inches to 3 feet or more. It is very dark brown to black at the surface, and becomes distinctly brown with depth. At 20 inches or more the well-decomposed organic matter gives way to more fibrous material or peat. The underlying soil ranges from clay to sand and gravel.

Muck is mapped in large and small areas in every town in the county. The largest areas lie along Flint Creek in the town of Potter, and along West River at the head of Canandaigua Lake. The type everywhere is low and flat. It receives run-off from the surrounding, higher lying areas, and is naturally poorly drained. The two larger areas are swampy most of the year.

The timbered areas support sparse stands of elm, soft maple, black ash, cedar, tamarack, hemlock, and alder. Some areas are covered with reeds, cat-tails, rushes, sedges, and aquatic plants. A little hay is cut, and some pasturage is obtained. Ninety-eight per cent of the type is undeveloped. Artificial drainage is essential before cultivation can be carried on.

Reclaimed areas of Muck in the adjacent county of Ontario produce excellent crops of celery, onions, potatoes, cabbage, and hay. In the production of these crops large quantities of commercial fertilizers and stable manure are used.

ROUGH STONY LAND.

Rough stony land includes abrupt, steep slopes along streams, where the soil material is mixed with large quantities of stone or where the bedrock is exposed. It is mapped in several areas along Keuka Lake Outlet, Plum Point Creek, Big Stream, Rock Stream, and smaller streams in the eastern and southeastern parts of the county. The slopes in many places are perpendicular, so that the soft shales are exposed to weathering. Areas of rough stony land have no agricultural value.

SUMMARY.

Yates County lies in the central part of western New York, in the Finger Lake region. It has an area of 343 square miles, or 219,520 acres.

The surface varies from undulating and gently rolling to hilly and mountainous. The lowest elevation is about 440 feet above sea level, along Seneca Lake, and the highest elevation is 2,110 feet, in the southwestern part of the county. The farms in the uplands have fair to good natural drainage. The bottom lands along the larger streams are poorly drained. Most of the drainage of the county goes northward into the St. Lawrence system.

Settlement in Yates County was begun in 1788, and by 1880 the population was 21,087. By 1909 it had dropped to 18,642. The early settlers came largely from the New England colonies. The present population is made up of their descendants and of newcomers of English, German, Norwegian, and Dutch descent. Approximately 75 per cent of the population is rural, and the density of rural settlement is reported as 40.9 persons per square mile. Penn Yan is the county seat and the largest town in Yates County.

The climate is typical of the Finger Lake region of New York. The winters are cold and the summers warm. The average length of the growing season is 163 days. Rainfall is well distributed throughout the growing season.

Agriculture is the main industry of Yates County. Corn, wheat, beans, and hay are the most important general farm crops grown. Grapes and apples are the principal fruits. Dairying is not important. Sheep husbandry is the main live-stock industry. The total value of all farm products in 1909 was $3,478,078, or an average of $1,520 per farm.

The farmers in general recognize the value of crop rotations. Commercial fertilizers are used on more than 60 per cent of the farms.

The total number of farms decreased from 2,504 to 2,288 during the decade 1900 to 1910. The average farm contains 89.3 acres. About 77 per cent of the farms are operated by owners. Almost 82 per cent of all the farm land is improved. Land values range from $5 to $200 an acre.

The soils of Yates County have been derived principally from glacial débris composed largely of sandstone, shale, and limestone. Some areas are occupied by alluvial, residual, or cumulose soils.

The Ontario soils are derived from limestone and sandstone. They have brown surface soils and lighter brown subsoils. Three members of this series are mapped. Corn, wheat, beans, and hay are the principal crops grown on the Ontario soils. Agricultural conditions are

very good. Land values range from $75 to $200 an acre for good farming areas.

The Wooster soils are derived from sandstone and shale material laid down as deep till. Four members of this series are mapped. Agricultural conditions on the Wooster soils are good.

The Volusia soils are brownish gray to yellow in color. They are derived from sandstone and shale and are poorly drained. Three types of this series are mapped in Yates County. The Volusia soils are not well developed agriculturally. Land values are high as compared with the prices for similar soils in other sections of the State.

The Allis and Lordstown soils represent thin glacial deposits from sandstone and shale. The Allis silt loam is poorly drained, while the Lordstown soils are fairly well drained. Agriculture on these soils is only fairly well developed.

The Schoharie silty clay is derived from fine lake sediments. It is naturally rather cold and poorly drained, but much of it has been tiled and is under cultivation. General farm crops are grown and the yields are good.

The Chenango soils consist of old alluvium laid down in the form of terraces, the material is largely from sandstone and shales. The Chenango soils are in a good state of agricultural improvement.

The first-bottom soils are grouped in the Holly, Genesee, and Papakating series. The Holly soils are gray, with mottled subsoils, and are poorly drained. The Genesee soils are brown and fairly well drained. The Papakating soils are black and poorly drained. These alluvial soils are used to some extent as hay and pasture land.

Muck occurs in all parts of the county, and some of the areas are quite extensive. None of this soil is under cultivation.

Rough stony land occurs in small areas and is mainly nonagricultural.

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