U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE NEW YORK STATE COLLEGE OF AGRICULTURE,
CORNELL UNIVERSITY, A. R. MANN, DIRECTOR; E. O. FIPPIN,
IN CHARGE SOIL SURVEY.

SOIL SURVEY OF CHENANGO COUNTY, NEW YORK.

BY

E. T. MAXON, OF THE U. S. DEPARTMENT OF AGRICULTURE,
IN CHARGE, AND WILLIAM SELTZER, OF THE NEW
YORK STATE COLLEGE OF AGRICULTURE.

W. E. McLENDON, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]

WASHINGTON:
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1920.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., September 27, 1919.

SIR: I have the honor to transmit herewith the manuscript report and map covering the survey of Chenango County, New York, and to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils, 1918, as authorized by law. This work was done in cooperation with the New York State College of Agriculture.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF CHENANGO COUNTY, NEW YORK.

By E. T. MAXON, of the U. S. Department of Agriculture, In Charge, and WILLIAM SELTZER, of the New York State College of Agriculture.—Area Inspected by W. E. McLENDON.

DESCRIPTION OF THE AREA.

Chenango County, New York, is situated in the south-central part of the State, in the second tier north of the Pennsylvania line. The Unadilla River forms most of the eastern boundary. The county is in the form of a rectangle, the extreme dimensions being 39½ miles north and south, and 32 miles east and west, respectively. The county is divided into 21 towns and comprises a total area of 894 square miles, or 572,160 acres.

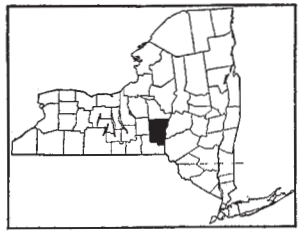

FIG. 1.—Sketch map showing location of the Chenango County area, New York.

Chenango County lies along the northern border of the Allegheny Plateau, an elevated area occupying the southern part of the State and extending thence southward. The general elevation of this plateau ranges from about 1,500 to 4,000 feet above sea level. Chenango County averages about 1,700 feet, the higher points in the northern part of the county lying a little higher than this, and the greater part of the southern end lying a little lower.

This plateau region is deeply dissected by numerous valleys, some narrow and some broad. The depth of the dissection varies from 400 to 700 feet. The valley walls are sloping rather than abrupt. Access is possible to all parts of the area, though travel in places is tedious, more on account of the depth of the valleys than of the steepness of the slopes.

The plateau of central New York is traversed by a series of relatively broad valleys extending from the lowland north of the plateau southward across it to the valley of the Susquehanna River, along the southern border of the State. These broad valleys have almost complete control over the drainage, instead of being themselves controlled by it. The larger creeks flowing into the Susquehanna and

Delaware Rivers, as well as those flowing northward into the Great Lakes, rise within these valleys, the watersheds lying on the valley floor with no visible ridges to mark their limits. Chenango County lies immediately south of the watershed in many of these large valleys.

The extreme southeastern part of the county is traversed by the broad Susquehanna Valley. The eastern part is bounded by the broad Unadilla Valley, from which numerous narrow valleys extend. The southwestern, central, and north-central parts of the county include the Chenango Valley, which varies in width from a few hundred yards to more than a mile. The more important of the lateral valleys extending from the Chenango are the Genegantslet, Canasawacta, and Handsome Creek Valleys. The northern and northwestern parts of the county are dissected by relatively narrow valleys with steep slopes.

Owing to the rolling topography and the numerous draws and small streams, the run-off is ample. The larger streams have sufficient gradient to carry all the drainage, except at times of unusually heavy precipitation. The drainage of the northwestern part of the county is carried by the Otselic Creek, that of the northern and central parts by the Chenango River, and that of the eastern and southeastern parts by the Unadilla and Susquehanna Rivers. The other rivers are all tributary to the Susquehanna. A few poorly drained areas occur in the bottom lands along the streams.

This region was settled about 1785 or 1788 by people from New England, mainly from Connecticut and Massachusetts. The county was organized in 1798, and development has proceeded gradually. The numerous streams furnished abundant water power, which was used for gristmills and sawmills. Tanneries, distilleries, and asheries were also built and flourished, but have since been abandoned.

Twenty-five years after the county was first settled the population was 21,704. Growth continued until 1840, when the maximum of 40,785 was reached. Since that date there has been a steady loss in total population, the increases in the urban population not being sufficient to offset the loss in rural communities. For 1910 the census gives the urban population as 7,422 and the rural population as 28,153.

The present population is made up largely of descendants of early pioneers, and many of the inhabitants operate the farms taken up by their forefathers. A large percentage of the inhabitants of the towns are directly or indirectly engaged in agricultural pursuits.

Norwich, the largest town and the county seat, is situated northeast of the center of the county. In 1910 it had a population of 7,422. Oxford, with a population of 1,654, is about 8 miles southwest of Norwich. Greene and Bainbridge, in the southwestern and south-

ern parts of the county, had populations of a little over 1,100. New Berlin, in the northeastern part, on the Unadilla River, had a population of 1,114 in 1910. Sherburne, Mount Upton, Afton, South Otselic, Guilford, Smithville Flats, South New Berlin, and Smyrna are of local importance as trading centers.[1]

Most of Chenango County has easy access to railroads traversing the main valleys. The Delaware & Hudson Railroad follows the Susquehanna Valley in the southeastern part of the county, the Delaware, Lackawanna & Western from Binghamton to Utica traverses the Chenango Valley, a line of the New York, Ontario & Western serves the eastern part of the county, and the Unadilla Branch of this system extends along the eastern border of the county. The northwestern part of the county has access to a branch of the Delaware, Lackawanna & Western, which runs to Cincinnatus, a town in Cortland County near the boundary line.

The highways throughout the county are generally in good condition. A system of improved or State roads extends through most of the valley sections. Mail and telephone service is available to almost all farms.

CLIMATE.

The climate in this section of the State is characterized by a wide range in temperature between the summer and winter seasons. The summers are usually warm, with occasional periods of extreme heat. The winters are usually about 5 or 6 months in duration, and very often extremely cold weather and heavy snows are experienced. Sometimes the winters are mild and open, and such weather may prevail for short periods during an otherwise severe winter. The mean annual temperature as recorded at the nearest Weather Bureau station, at Cortland, in Cortland County, is 44.5° F. January and February are the coldest months and July and August the warmest. The extreme range for the county is 130°, from —29° in January to 101° in July.

There is probably some difference in temperature and in the length of the seasons between the hill sections and the valleys, owing to the difference in altitude. At Cortland the average date of the first killing frost in the fall is September 29, and that of the last killing frost in the spring, May 15. Killing frosts have occurred as early in the fall as September 10, and as late in the spring as June 10. The late spring frosts retard the early growth of corn and potatoes, while the early fall frosts sometimes prevent full development of the crops. The average length of the growing season is 137 days.

[1] Since this report was written the preliminary announcement of the population of Chenango County and its civil divisions in 1920 has been issued by the Bureau of the Census, as follows: Chenango County, 34,969; urban, 8,268; rural, 26,701; Norwich, 8,268; Oxford, 1,590; Greene, 1,297; Bainbridge, 1,259; New Berlin, 1,070; Sherburne, 1,104; Afton, 782.

The precipitation is quite evenly distributed throughout the year, but periods of drought sometimes occur late in the summer, and the rains are often very heavy in the spring, frequently retarding planting. The mean annual precipitation is about 41 inches. The lowest precipitation recorded in any year was 29.40 inches, in 1899, and the highest 55.25 inches, in 1857. There is little regularity in the precipitation from one month to another. Severe thunderstorms seldom occur.

The following table gives the normal monthly and annual temperature and precipitation and the maximum and minimum temperature, according to records covering a period of 54 years, at the Weather Bureau station at Cortland:

Normal monthly, seasonal, and annual temperature and precipitation at Cortland, Cortland County.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1899).	Total amount for the wettest year (1857)
	° *F.*	° *F.*	° *F.*	*Inches.*	*Inches.*	*Inches.*
December	26.2	65	−13	3.10	3.98	3.29
January	22.5	68	−29	2.60	1.88	3.02
February	22.0	61	−23	2.30	0.69	2.05
Winter	23.6	68	−29	8.00	6.55	8.36
March	30.5	80	−12	2.70	1.83	2.58
April	42.7	92	10	2.95	0.56	6.78
May	54.3	94	23	4.00	2.50	4.38
Spring	42.5	94	−12	9.65	4.89	13.74
June	62.9	92	29	4.30	2.25	12.55
July	67.1	101	36	4.90	4.69	2.39
August	65.0	100	35	3.80	2.64	5.40
Summer	65.0	101	29	13.00	9.58	20.34
September	57.9	92	26	3.40	2.40	4.45
October	46.9	85	18	3.90	2.99	4.88
November	36.2	73	0	3.15	2.99	3.48
Fall	47.0	92	0	10.45	8.38	12.81
Year	44.5	101	−29	41.10	29.40	55.25

AGRICULTURE.

At the time of settlement this region was heavily forested with hard maple, white pine, beech, elm, basswood, chestnut, and birch. The settlers commenced to clear the land and grow subsistence crops. They soon recognized the adaptation of this region for raising live stock. The opening of the Chenango Canal in 1837

from Binghamton to Utica played a very important part in opening up this region to more diversified farming. The census of 1844 reports 2,816,291 pounds of butter produced in Chenango County, 1,145,057 pounds of cheese, and 503,938 pounds of wool. Droves of cattle were also brought in and fattened upon the succulent pastures through the county. The grains most extensively grown were wheat, barley, rye, and oats.

Dairying and general farming is the most important industry at the present time. The principal crops are hay, oats, corn, buckwheat, and potatoes. Some maple sugar is manufactured, and small quantities of lumber are cut.

Hay is the first crop in point of acreage. The area devoted to hay and forage is several times greater than that used for all the cereal crops combined. Of the total area in the two former crops, 136,972 acres is in tame or cultivated grasses. In 1909 timothy occupied 13,962 acres, producing 17,117 tons; timothy and clover mixed, 88,838 acres, producing 104,322 tons, and clover 566 acres, producing 807 tons. The general acid condition of the soils makes liming necessary in order to get a good stand of clover. In 1909 there were 877 acres in millet, which produced 1,955 tons. Most of the millet is used as green feed.[1]

The oat crop is the first in acreage among the cereals. The area in oats does not vary much from year to year. In 1917 approximately 18,000 acres were grown, with an average yield of 32 bushels per acre. Yields on some farms range from 60 to 70 bushels in favorable seasons. The oat crop is generally used on the farm.

Corn is important among the dairy farmers throughout Chenango County. It was formerly grown for the grain, despite the shortness of the season, but with the heavy winter feeding and the introduction of the silo, more of it is being used as forage. In 1909 corn was grown for grain on 4,065 acres, and gave an average yield of 44 bushels. In 1917 the area was reduced to 2,800 acres. The main variety grown is the Eight-Row Yellow. The acreage of corn grown for ensilage shows a steady increase. In 1917, 9,300 acres were grown. The yield ranges from 7 to 15 tons per acre, with an average of about 9 tons. Luce's Favorite, Leaming, and Sweepstakes are the leading varieties.

The acreage devoted to wheat has varied greatly during the last 40 years. In 1879 more than 3,300 acres were grown, and in 1909 only 35 acres. In 1917 approximately 1,600 acres were devoted to wheat, of which 1,000 acres were in spring wheat, yielding an average of 16 bushels per acre, and 600 acres in winter wheat, yielding an average of 20 bushels. Yields of 40 and 50 bushels are reported by individual farmers.

[1] Statement of crops and yields given in this report obtained from the 1910 Federal Census and from the New York State Agricultural Census compiled from reports of farm bureaus in 1917 and 1918.

Rye and barley have never been important crops, and at present their total acreage is only about 1,100 acres. Cabbage is grown on a small scale, 965 acres being reported in 1917. The acreage devoted to field beans fluctuates from year to year, but it is probably increasing. In 1917 approximately 600 acres were grown. The Medium White and Yellow Eye are the leading varieties. A total of 380 acres was devoted to alfalfa in 1917.

Potatoes are a crop of considerable importance. The acreage remains fairly constant from year to year. In 1909 the total area in potatoes was 4,843 acres, and the production amounted to 671,087 bushels. This gives an average yield of about 138 bushels per acre, which is probably greater than the average for a number of years. The leading varieties grown are Carmen, Green Mountain, and Rural New Yorker.

Considerable fruit, including apples, pears, plums, cherries and small fruits, is produced in Chenango County. There are a number of good apple orchards, and almost every farmer has at least a few trees to furnish fruit for home use. There were 145,604 apple trees in the county in 1909. Small fruits, including strawberries, blackberries, and raspberries, are grown to some extent, particularly in the vicinity of the towns.

The maple sugar and sirup industry has long been an important source of farm income. There were 331,168 pounds of maple sugar and 4,676 gallons of sirup manufactured in 1879, as compared with 153,655 pounds of sugar and 34,713 gallons of sirup in 1909.

Chenango County is one of the important dairy counties of the State, being fifth in number of gallons of milk produced. In 1909, according to the census, 24,059,054 gallons[1] of milk, 128,452 pounds of butter, and 300 pounds of cheese were produced. A large quantity of milk is manufactured into condensed and evaporated products by the numerous stations throughout the county. Trainloads of milk are shipped daily into New York City. The dairy industry is fairly well distributed throughout all sections of the county. The total value of dairy products in 1909, excluding home use of milk and cream, amounted to $2,975,681. In general the dairy cattle are grade stock, but there are a number of purebred herds. The Holstein is the predominating breed, followed by the Jersey and Guernsey.

In 1910 the total value of domestic animals in Chenango County was $4,437,459. The stock included 77,994 head of cattle, 10,055 horses, 84 mules, 6,327 hogs, 5,866 sheep, and 245,256 fowls. The total value of the live-stock products for 1909 was $4,639,732, as compared with a value for all crops produced of $3,398,963.

The live-stock industry has undergone a marked change during the last 70 years. The earlier farmers raised horses, fattened beef

[1] There is no way to determine how much of the milk produced in the county is used in the manufacture of cheese, butter, or milk products, or whether much milk is sent to the factories from farms outside the county.

animals, and kept sheep. In 1845 there were 233,453 sheep in the county. Sheep raising continued until about 1875, when the tariff on wool was removed. Since 1880 dairying has been the chief branch of agriculture.

The farmers in general recognize the crop adaptation of certain soils. The hardpan soils of the Volusia series are regarded as best adapted to grasses, the well-drained soils of the Lackawanna, Lordstown, and Wooster series to potatoes and root crops, and the gravelly soils of the valleys, embraced in the Fox and Chenango series, to corn. Buckwheat is considered the most suitable crop for the poorer soils. Alfalfa does best on the well-drained soils.

The majority of the farmers in Chenango County do not follow any systematic rotation. Hay is considered the most important crop and the hay land is usually left until it begins to "run out," when it is plowed and usually planted to corn or potatoes, to be followed by oats or wheat, with the aim of getting it back into grass again. As a larger acreage is devoted to grass than to all the cereal crops combined, it is evident that the fields in sod must be left for a number of years at a time. Most of the farmers realize the value of crop rotation, and are giving more and more attention to working out the most beneficial and practical system.

Commercial fertilizers have been used in increasing quantities until the last few years. In 1889 the total expenditure for fertilizer was $28,032; in 1899, $48,590; and in 1909, $86,591. The inability to obtain certain ingredients, together with the higher cost, has cut down the amount used during the last two or three years. Commercial fertilizer is generally used on corn, potatoes, cabbage, and oats. Nearly every farmer makes use of the barnyard manure produced, spreading it either on the sod land or on corn stubble. Lime is widely used with excellent results, the application ranging from 500 to 2,000 pounds per acre. It is usually applied on plowed land for all crops except potatoes.

Grain crops usually are thrashed at the barn, the straw being placed under cover or stacked for use during the winter. Hay is generally stored in large barns or stacked in the fields. The potato crop is either sold directly from the field, or stored in cellars to be sold at a later date. Cabbage is usually harvested and sold directly from the field.

The farm buildings in this county are usually large and substantial. Modern machinery is in common use, including 2-way riding plows, harrows, corn and grain drills, mowing machines, hay loaders, reapers, corn cutters, and milking machines.

The work stock consists almost exclusively of horses. Three or more horses are used for the heavier work. Several tractor engines are in use.

In 1909 the value of all property per farm in Chenango County was $4,911.23, of which 36 per cent was represented by land, 35.2 per cent by buildings, 6.7 per cent by implements, and 22.1 per cent by domestic animals.

Reliable farm labor is scarce and wages are rapidly increasing. The obtaining of farm labor is one of the most pressing problems at the present time.

Land values in this county range in general from $8 to $150 an acre. Cut-over timber land can be bought as low as $5 an acre. Hill farms are held at $8 to $45 an acre, with an average of about $20. Valley farms are held at $35 to $150, with an average of $75. Values depend largely upon the location and distance from market, as well as upon soil differences. Many hill farms can be purchased for less than the cost of replacing the buildings.

Practically all of the farms on the Volusia, Norwich, Tyler, Holly, and Genesee soils are, or have been, in need of drainage. Although the rolling topography of the Volusia and Norwich soils usually insures good surface drainage, the compact, rather peculiar structure of the subsoils makes underdrainage necessary. All the other soils have good surface drainage as well as underdrainage. As the growing season in Chenango County is rather short, the delay in planting crops in the spring and the slow growth in the cold, wet soil results in much loss, even if only the damage from frost and not the lower yields be considered. All the soils in the county are naturally in need of lime. This generally acid condition doubtless accounts for much of the difficulty in maintaining good stands of clover.

SOILS.[1]

Chenango County lies entirely within the glacial region, near the northern border of the Allegheny Plateau. The underlying consolidated rocks are of Devonian age. Light-colored shales and sandstone predominate throughout the county. The red shales and shaly sandstones of the Oneonta group are well developed in the towns[2] of

[1] Chenango County adjoins Madison County on the north, Cortland County on the west and a part of Broome County (Binghamton Area) on the south. In certain cases the soil maps apparently do not agree along the boundaries. This is due to changes in correlation resulting from a fuller knowledge of the soils of the State. The upland soils grouped in the Volusia series in the surveys of Madison County and the Binghamton area are now shown to belong to three series and are so shown on the Chenango County map. The Volusia silt loam of the earlier work is now mapped as the Lordstown stony silt loam, Lordstown silt loam, Wooster stony silt loam, Wooster silt loam, and Volusia stony silt loam, and Volusia silt loam. The Volusia loam as mapped in Madison County corresponds for the most part to the Wooster silt loam and Wooster gravelly silt loam of Chenango County, also giving rise to the Ontario silt loam, where there is considerable limestone influence. The Dunkirk gravelly loam of Madison County and the Binghamton area corerspond to the Fox gravelly loam and Chenango gravelly silt loam of Chenango County and the Wabash loam of the Binghamton area is too light in color and not of the right origin for Wabash and it would now be classed in the Holly series. Where boundary differences appear in these maps the names used in Chenango County should be applied to the abutting soils in the earlier surveys.

[2] The word "town" in New York is synonymous with "township" in other Stats.

Guilford, Norwich, Oxford, and Preston, and to a smaller extent in New Berlin, Plymouth, Pharsalia, McDonough, and Smithville.

This entire region was covered by the continental glacier during the late Wisconsin stage of glaciation. Upon the final retreat of this ice sheet, not only was the topography modified, but the surface was left mantled with glacial débris, thin in some places and relatively thick in others, while through the valleys deep morainal deposits, as well as extensive gravel plains, were built up, and fine sediments were deposited in the existing lakes. Materials of more recent deposition occupy the stream flood plains and marshy and swampy areas where conditions have favored the accumulation of organic remains.

The glacial till represented in the ground moraine mantling the upland usually bears a close relation to the rocks over which it lies. Only an occasional fragment of granite or other crystalline rock is to be found, and most of the stones are angular, indicating that they are not far removed from their source. The deep morainal deposits in the valleys are of more mixed origin. Some of the areas in the Chenango Valley have been very strongly influenced by limestone, while other areas have sandstone and occasional crystalline fragments as the predominating material. In some areas there is considerable grit and gravel in the soil section, and the substratum may be little else than a bed of angular and rounded gravel, cobblestones, and sand.

The alluvial deposits in different parts of the county vary according to the source of their material and to drainage conditions. Where the glacial streams flowed from the gray sandstone and shale regions the soil is brown to yellow in color and the gravel consists of sandstone and shale. Glacial streams from the red sandstones and shales have laid down deposits of a dark-red color. Where the glacial streams flowed from regions of limestone débris the soil is dark brown in color and carries a considerable percentage of limestone fragments.

In the first-bottom or overflow lands no close distinction can be made on the basis of origin. It is probable that the soils in the areas associated with the calcareous terraces and morainal deposits are derived in part from limestone material, while those farther south and in the Unadilla and Susquehanna Valleys are almost altogether derived from sandstone and shale. Those derived from light-colored shales and sandstones are gray to grayish brown, while those derived from the red till soils have a distinct reddish tinge. In structure and agricultural characteristics the first-bottom soils seem to be uniform throughout the county.

The soils of Chenango County are classed in 11 series. The individual types having a common origin and similar color. topographic,

and drainage characteristics are grouped in series. The types within the series differ in texture. Twenty types, ranging in texture from silty clay loam to fine sandy loam, are mapped, in addition to Meadow and Muck. The group of soils derived from glaciated shale and sandstone materials predominates and is divided into five series. The light-colored shales and sandstones give rise to the Lordstown, Wooster, and Volusia series, and the red shales and sandstones to the Lackawanna and Norwich series.

Where the glacial drift is very thin and the underlying rock usually less than 3 feet below the surface, the soils are classed in the Lordstown series. The surface soils of this series are light brown to yellowish brown, and the subsoils are yellowish brown or light brownish yellow. This series includes most of the smoothly rolling and steep hill lands of the county, where the drainage is well established.

The soils of the Wooster series are similar to the Lordstown in color, but are confined to areas of deep till. They are well drained and thoroughly oxidized.

The Volusia series is characterized by brownish-gray surface soils and mottled gray, brown, and yellow compact subsoils. The Volusia soils are level to rolling and poorly drained.

The Lackawanna and Norwich series differ only in drainage. Where the drainage, both surface and internal, is good, the surface soil is dark red and the subsoil is only slightly lighter in color, and the material is classed as Lackawanna. Where the drainage is not well developed, the surface soil is dark red and the subsoil is red, mottled with yellow and brown. The soil here is classed in the Norwich series.

Soils derived from light-colored sandstone and shale having a considerable admixture of limestone fragments in either the surface soil or lower subsoil and which have been laid down as deep glacial till are classed in the Ontario series. Numerous areas along the Chenango Valley, mapped in this survey with the Ontario series, are more or less stratified and have the rough kame and kettle topography characteristic of the Rodman series.

The river-terrace soils and those that may be in part of lake origin may be divided into three groups, those derived from light-colored sandstones and shales, those derived from red sandstones and shales,[1] and those derived from mixed sandstones, shale, and limestone material where the latter predominates. The first two groups are divided into two series, the Chenango and Tyler, the first being well drained and the latter poorly drained. The third group embraces the Fox series.

[1] Tunkhannock soils. Owing to small area and difficulty of separation in this area, these soils mapped with Chenango soils.

The surface soils of the Chenango series are light brown and the subsoils are yellowish brown, resting upon beds of noncalcareous gravel or sand at a depth of 2 or 3 feet. The topography is relatively level, but the drainage is good.

The members of the Tyler series have a yellowish-brown to grayish-brown surface soil and a mottled yellow, gray, and brown subsoil. The topography is level, and the drainage is poor.

Areas with a dark-brown surface soil and a lighter brown subsoil, derived from limestone, sandstone, and shale and laid down as a high second terrace, are classified with the Fox series. The topography of these soils is level, but the drainage is well established.

The alluvial soils are divided into two series, which when typically developed are strikingly different in color, owing to variations in the source of the material and in the drainage conditions. Alluvium derived from light-colored shales and sandstones, where well drained, belongs in the Genesee series, and where poorly drained in the Holly. The Genesee series includes types with brown, mellow surface soils and lighter brown subsoils. The Holly series is characterized by gray surface soils and mottled gray, compact subsoils. These soils are naturally poorly drained.

Muck consists of vegetable matter in various stages of decomposition, mixed with some mineral matter. It has accumulated under poor drainage conditions.

Meadow is a term applied to low-lying areas, usually along stream courses, where the material can not readily be separated into types, owing to its variability in color and texture.

The following table gives the name and the actual and relative extent of each of the soils mapped in Chenango County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Lordstown silt loam	162,048	28.3	Fox gravelly loam	7,360	1.3
Wooster silt loam	112,512	19.6	Holly silt loam	4,928	0.9
Volusia silt loam	81,024	14.2	Ontario gravelly silt loam	3,200	0.6
Lordstown stony silt loam	37,952	6.6	Norwich silt loam	2,816	0.5
Volusia stony silt loam	34,048	6.0	Chenango silt loam	1,792	0.3
Lackawanna silt loam	21,760	3.8	Muck	1,280	0.2
Lackawanna stony silt loam	19,904	3.5	Fox fine sandy loam	832	0.2
Wooster gravelly silt loam	18,368	3.2	Gravelly phase	448	
Chenango gravelly silt loam	17,472	3.0	Holly silty clay loam	896	0.2
Wooster stony silt loam	15,488	2.7	Tyler silt loam	832	0.1
Meadow	11,968	2.1			
Genesee silt loam	7,872	1.4	Total	572,160	
Norwich stony silt loam	7,360	1.3			

LORDSTOWN STONY SILT LOAM.

The most distinctive feature of the Lordstown stony silt loam is the presence of stone, either loose upon the surface or in the form of ledges just below or protruding through the surface. In some places there is little stone on the surface, while in others the quantity is so large that cultivation is impracticable. The stones range from small, angular chips to large sandstone bowlders and slabs of shaly sandstone. The soil material consists of a yellowish-brown silt loam grading at 5 or 6 inches into a bright-yellow silt loam. The depth of the soil is generally less than 3 feet.

This is a rather inextensive soil. The largest areas are mapped mainly in the towns of Bainbridge, Afton, Guilford, Oxford, and Norwich, but there are typical areas in every town in the county. The type occupies steep slopes and sharp hilltops, as well as many gently rolling areas. Drainage is well developed, and in some places excessive.

This soil formerly supported a heavy stand of sugar maple, white pine, hemlock, and chestnut. Most of this has been removed, but some good stands of second-growth timber exist. A small proportion of the type supports a meager stand of scrub timber and underbrush. Most of the cleared land is used for pasture.

Only a small percentage of the Lordstown stony silt loam is under cultivation. The general farm crops of the region are grown, and the farming methods and the yields are about the same as on the silt loam.

Land values depend largely upon the nature of the adjacent soil type, the pasturage, or the timber stand.

Probably the greater part of this type should be used for forestry. The existing forest should be carefully managed, and attention given to reproduction. Some of the pastures might be profitably reforested and only the better pastures retained. These should be improved by cutting the brush, keeping down the weeds, top dressing, and occasionally reseeding.

LORDSTOWN SILT LOAM.

The surface soil of the Lordstown silt loam is a light-brown or yellowish-brown, mellow silt loam, extending to an average depth of 6 or 8 inches. The subsoil is lighter in color, or a brownish-yellow friable silt loam, resting upon sandstone and shale bedrock or masses of disintegrated rock at shallow depths, usually about 3 feet or less. In most areas the entire 3-foot section contains a small proportion of relatively small, angular fragments of light-colored sandstone. The stone content is variable from place to place, but seldom large enough to interfere with cultivation. Small patches of Lordstown stony silt loam are included with this type as mapped.

This is essentially a shallow-till soil, but small areas of material having the characteristics of the Wooster silt loam are necessarily included in places, owing to the difficulty in accurately locating the boundaries. There are also included some small, poorly drained areas that would have been mapped as Volusia silt loam had they been larger.

The Lordstown silt loam is one of the most widely distributed and extensive upland types in the county, being found in every township. It is most extensively and typically developed in the western and northwestern parts of the county. It usually occupies the upper slopes and narrow hilltops or ridges. Most of the type is undulating to rolling, but occasionally the slopes are too steep for practical cultivation. The surface run-off is good, and the mellow surface soil and the relatively open subsoil permit free internal movement of moisture. In some of the shallower areas crops sometimes suffer from lack of moisture in protracted dry seasons.

The original forest comprised a heavy stand of white pine, hard maple, chestnut, and beech. Practically all the virgin timber has been removed, but there is much good second-growth forest standing on the steeper slopes and in the more remote areas of the type.

Because of its wide distribution, this is one of the most important soil types in the county. Dairying and general farming are the main farm industries. Nearly every farm has its dairy herd and is managed primarily to provide forage for the support of this stock. The milk is usually hauled to milk stations or to creameries. The principal crops grown are hay, corn for ensilage, oats, buckwheat, and Irish potatoes.

Mixed timothy and clover ordinarily yield 1 to 1½ tons of hay per acre, although yields of 2 or 3 tons are not uncommon, especially where the soil is in a good state of cultivation. Over large tracts of this soil, especially in the more remote districts, the principal crop grown is hay, the quality and yield of which are not high because of the practice of cutting until the sod "runs out." Corn yields from 7 to 10 tons of ensilage per acre. Oats do well, yielding 30 to 50 bushels per acre. Buckwheat is grown extensively and yields 15 to 30 bushels per acre. Irish potatoes are an important cash crop. They yield in an average year about 100 bushels per acre, and yields sometimes reach 250 or 275 bushels. A few small fields of cabbage are grown, the yield ranging from 8 to 12 tons per acre.

Commercial fertilizers are little used on this soil, the farmers generally depending upon the manure from the dairies. Ground limestone is coming into more comon use, being applied to plowed land for any crop except potatoes. The applications range from 500 to 2,000 pounds per acre, averaging about 1,000 pounds.

Farms on this type vary in price from $10 to $75 an acre, depending upon the location with respect to towns and railroads, and the condition of the buildings. A large acreage of this soil has been thrown out of cultivation. Quite substantial buildings, including a house and barns, are found on most such farms. The mowing lands are sometimes cut and often the pastures carry a few head of stock. Such farms can be purchased at $8 to $20 an acre, usually less than the cost of replacing the buildings.

Owing to the manner in which the farms have been handled, this soil is deficient in organic matter and more or less acid. When available, heavy applications of manure should be made, or green-manure crops, such as rye or buckwheat, turned under. The adoption of short rotations and deeper plowing would be beneficial. Tests show conclusively the necessity of using some form of lime during the rotation.

The following table gives the results of mechanical analyses of the soil and subsoil of the Lordstown silt loam:

Mechanical analyses of Lordstown silt 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.*
162711	Soil	1.0	2.6	1.2	4.0	15.4	60.0	15.9
162712	Subsoil	1.8	3.2	1.6	4.0	17.2	55.2	17.2

WOOSTER STONY SILT LOAM.

The surface soil of the Wooster stony silt loam is a light-brown, mellow silt loam, 5 to 8 inches deep. The subsoil to a depth of 36 inches or more is a yellowish-brown, friable silt loam. A distinguishing feature of this type is the high stone content, not only on the surface but throughout the entire 3-foot section. The fragments vary in size from small chips to large, angular slabs and bowlders of sandstone, and occasional bowlders of rocks foreign to the region. The quantity of stone is variable from place to place, but generally there is sufficient to interfere with cultivation. The boundary between the deep till of this Wooster soil and the shallow till of the Lordstown is in places more or less indistinct.

The Wooster stony silt loam occurs along the steeper slopes of the valleys and in some level areas. It is well developed in the Chenango Valley in the towns of Greene, Oxford, Norwich, and North Norwich. Typical areas are mapped along the Genegantslet, Otselic, Brakel, and Canasawacta Valleys, and smaller areas throughout the central and northern parts of the county. The surface relief and the high content of stone insure thorough drainage.

This type originally supported a heavy growth of the native timber, but now there is only a second or third growth of maple, beech, hemlock, and chestnut. More than 75 per cent of the type is in forest or pasture, and agriculture is only fairly well developed over the remainder of the type. General farming, in connection with dairying, is carried on, the common farm crops of the region being grown. Only fair yields are reported.

This soil is mainly suited for use as pasture or for forestry. The permanent pastures can be improved by cutting the weeds and removing the brush. Systematic cutting and careful management of the standing timber as well as replanting are to be recommended.

WOOSTER GRAVELLY SILT LOAM.

The Wooster gravelly silt loam, to a depth of 6 or 8 inches, consists of a light-brown or yellowish-brown, mellow, gravelly silt loam. The subsoil is a brownish-yellow to yellow gravelly silt loam continuing to a depth of 36 inches or more, where the material becomes grayer in color and often coarser in texture. Scattered over the surface and throughout the entire 3-foot section is a variable, though usually small, percentage of angular and rounded fragments of light-colored sandstone, ranging in size from small chips and gravel to large bowlders.

This gravelly type probably represents the deepest till in the county. In deep cuts the underlying material is seen to be made up of rounded and subangular rock fragments in a more or less stratified arrangement.

The percentage of gravel is variable from place to place, but there is seldom sufficient gravel to interfere seriously with tillage operations. The texture may also vary from place to place; in the large areas northeast of Afton the material approaches a loam in texture. The areas extending from the vicinity of Greene northward along the Chenango Valley to Sherburne differ from typical in that the material below the 3-foot section carries a high percentage of limestone fragments, both angular and waterworn. Because of the covering of sandstone débris overlying these areas and owing to the lack of agricultural difference, this soil is not separated into the Ontario series, with which it otherwise might be classified.

The Wooster gravelly silt loam occurs in, and along the sides of, the larger valleys throughout the county. The most extensive areas are found in the Susquehanna Valley, in the southeastern part of the county; along the Unadilla Valley in the eastern portion; through the Chenango Valley in the central part; and along the Genegantslet and Otselic Valleys in the western part. Small typical areas are scattered throughout the narrow valleys. The topography varies

from nearly level to rough and morainic, the rolling areas being the more typical. In some places the surface is marked with small kettle holes.

The rolling topography and loose, gravelly substratum insure good drainage. Some of the rougher and more gravelly areas are subject to drought during short periods every year.

Approximately 80 per cent of this soil has been cleared and brought under cultivation. It is devoted to the general farm crops of the region, and average yields are obtained. The rougher areas are in timber or permanent pasture.

Land values range from $15 to $75 an acre, depending upon the topography, the location with respect to markets and good roads, and the character of the improvements.

Short rotations, replenishment of the organic content, and the use of agricultural lime would improve this soil. The rougher areas should be reforested.

WOOSTER SILT LOAM.

The Wooster silt loam consists of a light-brown to yellowish-brown silt loam, with a depth of 6 to 10 inches, usually about 7 or 8 inches. The subsoil is a light-brown or brownish-yellow, friable silt loam extending to a depth of 36 inches or more. Both soil and subsoil contain a low percentage of small, angular fragments of light-colored sandstone, with here and there a larger angular slab or bowlder. In some areas the lower subsoil grades into gray, unoxidized material ranging in texture from silt loam to fine sandy loam. Small areas of Volusia silt loam may be included with the type.

Where typically developed the Wooster silt loam represents deep till, but the boundary between it and the Lordstown silt loam is in many places indistinct.

The Wooster silt loam is an important soil type. It is typically developed in all parts of the county, but most extensively in the northeastern portion. It occurs along the lower slopes and at the heads of the valleys, extending into the higher elevations.

The surface is gently undulating to rolling, and in some places relatively steep. In practically all cases the slope is sufficient for surface run-off, while the loose, relatively open structure and depth of the till permit of thorough underdrainage.

This is one of the most desirable upland types in the county. It is adapted to a wide range of crops. Approximately 75 per cent is cleared, and 60 per cent is under cultivation. Dairying in combination with general farming is the chief industry. Hay, corn, oats, wheat, and potatoes are the leading crops. Hay yields three-fourths ton to 2 tons per acre, corn for ensilage 8 to 14 tons, and potatoes 100 to 225 bushels. Apples and small fruits do very well.

Crops are rotated to a small extent. After seeding, clover is grown for one year, mixed hay the next season, and timothy for about two years more. The sod is then turned under, and the field is either sown to oats and reseeded or planted to corn or potatoes for one year. Both winter and spring wheat have been grown, with marked success, during the last two seasons. A small quantity of commercial fertilizer is applied to the corn or oat crop. Stable manure is generally applied at least once during the rotation. Lime is being used, with marked success.

As dairying is the chief source of income, the crops are grown primarily to furnish forage for the stock. The predominating breed of cattle is the Holstein. The herds are large and well housed. The milk is sold raw, either being hauled directly to the station by the producer or collected by large trucks making daily trips through the country.

The farm dwellings on this soil are substantial and usually in a good state of repair, and the farms are well fenced. Improved machinery is used in cultivation. The buildings are large and commodious, and consist of a large basement barn for storing the forage and housing the stock, at least one silo, and smaller buildings for tools. Water for the cattle is plentiful.

Land of this type sells for $20 to $75 an acre, depending upon the location and improvements.

Numerous tests on this soil have shown increased yields following the use of lime, and liming should be done much more extensively. It would also be profitable to follow shorter rotations, as the general tendency is to keep the land in grass too long before reseeding. The turning under of a heavy sod, or a green crop such as rye or buckwheat, would materially increase the content of organic matter and improve the crop-producing power of the soil. Some of the pastures on this type could be improved by cutting the rank weeds and by occasionally reseeding.

VOLUSIA STONY SILT LOAM.

The most distinctive feature of the Volusia stony silt loam is its position in depressions or around stream heads, and the presence of fragments of sandstone ranging in size from small pieces to large slabs and bowlders. The surface soil to a depth of about 6 inches is a light brownish-gray, stony silt loam. The subsoil, extending to 36 inches, is a light-yellow to gray, compact stony silt loam, mottled with orange yellow and rusty brown. In some places the mottling comes nearly to the surface, while in others it is deeper, occasionally occurring 20 inches below the surface. The stone content is variable from place to place, but usually is sufficient to interfere with cultivation.

This type is widely distributed throughout the uplands, principally in the towns of Preston, Smithville, McDonough, Plymouth, Oxford, and Pharsalia. Smaller, typical areas are mapped in most of the other towns. The type occurs along slopes, in depressed areas, and around stream heads. The topography varies from level to steeply rolling. Drainage invariably is poorly developed.

This soil formerly supported a heavy forest, which has been largely removed. Most of the cleared land is now used for pasture. A small percentage is under cultivation to general farm crops, but the poor drainage and large stone content make tillage difficult.

As there is not any strong demand at present for any but the best agricultural land, this type should apparently be used for pasture or, preferably, for some kind of forestry.

VOLUSIA SILT LOAM.

The surface soil of the Volusia silt loam, to an average depth of 6 or 8 inches, is a grayish-brown to yellowish-gray silt loam. The subsoil from 7 to 36 inches is a mottled gray and yellow, or gray, yellow, and brown, compact silt loam. The depth to the mottling varies with the drainage, and ranges from 4 to 20 inches below the surface. The hardpan layer which is a characteristic feature of this soil is usually found at 10 to 20 inches below the surface and consists of a mixture of silt, clay, sand, and rock fragments, more or less thoroughly cemented together. The texture of this type is fairly uniform throughout the county. Scattered over the surface and throughout the 3-foot section is a variable quantity of small, angular sandstone fragments, together with an occasional bowlder.

While the type as a whole presents the same general characteristics, it includes numerous variations. In general, the color of the surface soil can best be described as grayish brown, although there is considerable variation, depending largely upon the drainage and the amount of moisture actually in the soil. In general, the more nearly level the surface the grayer the color, while more yellow is mixed in the brown as the surface becomes more rolling. In dry, plowed fields the surface material becomes light gray, but when moist this changes to light brown. There is usually a distinct change in color between the surface soil and subsoil, particularly in areas under cultivation. In forested areas, or where the land has never been plowed, this change is more gradual, and the soil is usually shallower. The predominating color of the subsurface layer is pale yellow, but it is often mottled to some extent with gray, and these gray mottlings always appear at a greater depth than 11 to 15 inches, the subsoil from these depths down to 18 to 36 inches nearly always being mottled.

The Volusia silt loam is an important and widely distributed soil. It is most extensively and typically developed in the western and southern parts of the county in the towns of Pharsalia, German, McDonough, Preston, Smithville, Oxford, Greene, Coventry, Bainbridge, and Afton. Smaller areas are found in other parts of the county, but only a few occur in the northeastern section.

The surface varies from undulating or gently rolling to hilly. Much of the type occurs around the heads of streams and near slight depressions. Generally, however, there is sufficient slope to allow some run-off, but the heavy, compact subsoil prevents good underdrainage. As a result of the heaviness and retentiveness of the subsoil the type is rather cold, warming up slowly in the spring and causing considerable delay in planting. Good underdrainage would undoubtedly tend to alleviate this condition.

Much of the original forest growth, consisting of sugar maple, beech, hemlock, and elm, has been removed. On some of the hills there are now good stands of second-growth maple and beech.

The Volusia silt loam is almost entirely devoted to dairying and general farming. The principal crops grown are hay, buckwheat, and oats. The soil is best suited for the production of hay and for grazing. The yields show a wide range, from the lowest to almost the best in the county, depending almost entirely upon the cultural methods.

In general the farms on this soil type are poor and run down, with the result that the region is known as the "abandoned farm section of New York." Factors contributing to this abandonment include poor drainage, resulting in shorter seasons and acidity of the soil; depleted organic content, from continued cropping; long distance from markets; lack of capital; and labor shortage. Large areas exist where the farm buildings are unoccupied, and the fields here are in sod which is cut in some cases and left idle in others, while the pastures are grown up with weeds and brush.

Land values over the Volusia silt loam range from $5 to $35 an acre, the higher valuation being for farms well situated and in a good state of cultivation.

This soil, which is extensive throughout all of southern New York, presents a real problem not only to the individual farmer but to the county and State. It formerly produced good crops, and it again can be made productive by means of drainage, the application of lime, crop rotations, and the plowing under of green or stable manure. Rather than have this land idle, or practically idle, the county or town would find it profitable to reforest large tracts which in time should prove a good investment.

LACKAWANNA STONY SILT LOAM.

The Lackawanna stony silt loam differs from the silt loam in its much rougher surface configuration and in the presence of a large percentage of stone fragments scattered over the surface. Outcrops of the underlying rock also are numerous. The surface soil is a dark-red, friable silt loam to a depth of 6 or 9 inches. The subsoil to 36 inches or more is a lighter red, though still dark-red, relatively heavy silt loam. Occasional patches of less than 10 acres of soil grading toward the Lordstown series are included with this soil in places.

Scattered over the surface and throughout the entire 3-foot section is a variable, though usually large, percentage of angular fragments of both light-colored and reddish sandstone, the latter predominating. These stony fragments range in size from small angular chips to large, massive bowlders. In many places the underlying rock either comes close to the surface or protrudes above. In general, this type is too stony and rough for the best use of farm machinery. In places small fields are found where the stone content is less than typical, and where, by gathering the smaller fragments, cultivation can be carried on, though under difficulty.

Several relatively large areas of Lackawanna stony silt loam are found throughout the east-central and eastern parts of the county, in the towns of Preston, Norwich, and Guilford. Smaller areas are mapped in the adjoining towns of New Berlin, Oxford, North Norwich, Plymouth, and Smithville. This soil occurs in the upland where the topography is rolling to rough, and its drainage is well established.

Most of the Lackawanna stony silt loam is in forest, consisting of maple, beech, chestnut, and some white pine. The greater part of the cleared land is used for pasture, only a small acreage being under cultivation. The cleared land can best be used for pasture, as it is quite well watered and holds the sod well. Where the pastures have run down it would be advisable to reseed with a good grass mixture, and to cut the rank weeds and brush. More care should be exercised in managing the forested part of the type, and several tracts might profitably be reforested.

LACKAWANNA SILT LOAM.

The Lackawanna silt loam consists of a dark reddish brown or dark-red, friable silt loam extending to a depth of 6 to 8 inches, and merging gradually into the subsoil, which is only slightly lighter in color and a silty loam in texture. Usually the lower subsoil is a heavy, compact silt loam, free from mottling. Scattered over the surface and throughout the soil section is a moderate quantity of relatively small, angular fragments and occasional large slabs and

bowlders of both light and reddish colored, hard sandstone and soft shale. Only in small areas where the underlying rocks come close to the surface is there enough stone to interfere with tillage operations.

Some of the areas of this type in the town of Preston are more or less variable in color, occurring as they do along the boundary between the red and gray sandstones, and they contain small patches of soil that might be correlated with the Lordstown or Wooster series if of greater extent.

The Lackawanna silt loam is not extensively developed in Chenango County. The largest areas are mapped in the towns of Guilford, Norwich, and Preston, with smaller areas in the towns of Oxford, Smithville, McDonough, Pharsalia, Plymouth, North Norwich, and New Berlin. The topography is rolling, and drainage is well developed.

This soil formerly supported a stand of white pine, chestnut, hard maple, beech, and oak. Only a small percentage now remains in forest.

This soil is held in high esteem by the farmers, as it is well adapted to all the staple crops. General farming in connection with dairying is the chief type of agriculture, with hay, oats, corn, and potatoes as the most important crops. Grasses do well, and the yields of hay range from 1 to 2½ tons per acre. Clover does not hold for any length of time unless the soil is limed. Oats yield from 30 to 50 bushels per acre. Corn is grown both for the grain and for ensilage, but ensilage corn predominates in acreage. The yields of grain range from 30 to 45 bushels per acre, and of ensilage from 8 to 10 tons. A good quality of potatoes is produced, with average yields of 75 to 200 bushels recorded. The pastures are good, and stand dry weather fairly well.

This soil is handled in about the same manner as the adjoining types. The sods are cut for three to five seasons, plowed for corn or potatoes, and reseeded with oats. Only small quantities of commercial fertilizer are used, the farmers mainly depending upon the stable manure from their dairies. Lime is used by a few farmers with good results.

Most of the farms upon this soil have a prosperous appearance. The buildings are substantial and kept in repair, and the fences are good.

Land values range from $20 to $75 an acre, with very few farms changing hands at the present time.

The use of some form of lime should be more general. Experiments carried out on farms on this soil in this county show that with the use of lime excellent stands of clover and better yields of timothy can be obtained.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Lackawanna silt loam:

Mechanical analyses of Lackawanna silt 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.*
162737	Soil	1.4	1.8	1.0	5.4	11.2	70.5	8.5
162738	Subsoil	1.8	2.2	1.2	5.6	12.6	56.0	20.7

NORWICH STONY SILT LOAM.

The distinguishing characteristic of the Norwich stony silt loam is its poor drainage and high stone content. The surface soil is a dark-red silt loam, with an average depth of about 6 inches. The subsoil is a chocolate-red silt loam, mottled with brown, gray, and ocherous yellow. Fragments of red and gray sandstone, ranging in size from small chips to large bowlders, usually cover the ground. Occasionally foreign bowlders are encountered.

Small areas are included that are relatively free from stone. Other areas may be more or less free from mottling but are included because of their poor drainage. Variations in the type as mapped are of frequent occurrence, especially in the towns of Preston and Plymouth, ranging from a poorly developed variation of Volusia stony silt loam to a soil that could well be classed as Meadow.

The Norwich stony silt loam is of small extent, and is only found in close proximity to the red till soils of the Lackawanna series, in the central and eastern parts of the county. It occurs along wet seepage slopes, around small stream heads, or on level positions throughout the uplands. Drainage is poorly established.

Most of this type is grown up in brush or supports a rank growth of coarse weeds and pasture grasses. Some small areas are under cultivation, and when the soil is not too wet it gives moderate yields of hay and grain.

The Norwich stony silt loam is probably most suitable for use as pasture land, provided the coarse weeds and undergrowth are removed. Some of the drier areas if underdrained and brought under cultivation would produce good crops. The flatter, more poorly drained areas should be reforested.

NORWICH SILT LOAM.

The Norwich silt loam, to a depth of 6 or 7 inches, is a brownish-red to Indian-red silt loam. The subsoil from 6 to 36 inches is a reddish silt loam, heavily mottled with gray, brown, and yellow. At 15 to 18 inches a compact layer consisting of sand, silt, clay, and angular stone fragments is often encountered. Moderate quantities of small

stones are scattered over the surface and throughout the lower subsoil. The texture is relatively uniform throughout the type, but the color of the surface soil and the intensity of mottling in the subsoil vary according to the drainage.

In some small areas, slightly elevated, the soil shows less mottling, and approaches in general characteristics the Lackawanna silt loam. Areas with a level surface, or in a depressed position, or along slopes down which water seeps, even though the 3-foot section does not show mottling, are included with this type. Some of the areas, especially in the towns of Preston and Plymouth, represent gradations from the typical Volusia on one side to the typical Norwich on the other.

The Norwich silt loam occurs in the east-central and eastern parts of the county, in the towns of Preston, Norwich, and Guilford. It is usually level to gently undulating, but a few areas are sloping. Poor drainage is the characteristic feature of this type.

Most of this soil has been cleared, and was probably at one time cultivated. At present it is largely in sod, in pasture, or practically abandoned, only a small acreage being under cultivation. It is handled in about the same manner as the corresponding Volusia type.

Land values range from $8 to $20 an acre, varying with the drainage, the location, and the improvements.

The suggestions mentioned for improving the Volusia silt loam can be applied equally well to this type.

ONTARIO GRAVELLY SILT LOAM.

The Ontario gravelly silt loam, to a depth of 8 or 9 inches, is brown or light brown in color, and a friable silty loam or silt loam in texture. The surface soil in plowed fields is light grayish or yellowish brown when dry. It usually contains a variable quantity of small, rounded and angular sandstone fragments. The subsoil, extending to a depth of 36 inches or more, is lighter in color than the surface soil, being a light-brown to yellowish-brown, gravelly silt loam. The gravel consists of both waterworn and angular fragments of limestone and other rocks. Below the 3-foot section the material consists of a light grayish brown to gray, compact mass of sandstone and limestone fragments embedded in sandy till.

The areas mapped in the vicinity of North Norwich and Sherburne Four Corners consist of morainic deposits made up of roughly stratified beds of sand and gravel, the predominating fragments of which are limestone. Such areas have the characteristics of the Rodman series as mapped in other counties in this State.

The Ontario gravelly silt loam is an important soil type, although it is not of large extent in Chenango County. It is mapped along

the Chenango Valley in the vicinity of and southward from Earlville. The topography is generally rolling, but there are a few rough, morainic areas. The drainage is well developed.

All but the rougher areas of this type are easily tilled and have been put under cultivation, the general farm crops of the region being grown. Hay, corn, oats, wheat, and cabbage give good yields. Clover or mixed hay yields from 1 to 2½ tons per acre. Alfalfa is a successful crop on this soil. Corn for ensilage yields 9 to 14 tons per acre; oats, 30 to 50 bushels; wheat, 15 to 30 bushels, and cabbage, 8 to 15 tons.

The farms on this soil are generally better managed and better tilled than those of the hill region. Dairying in connection with general farming is the principal form of agriculture. The dairy herds are large, and include many thoroughbred animals. Commercial fertilizers are used on the tilled crops, in addition to applications of stable manure. The farm buildings are substantial and maintained in a good state of repair.

Land values on the Ontario gravelly silt loam range from $35 to $125 an acre, depending upon the location and the character of the improvements.

CHENANGO GRAVELLY SILT LOAM.

To a depth of about 8 inches the Chenango gravelly silt loam consists of a light-brown to yellowish-brown, gravelly silt loam. The subsoil to a depth of 36 inches or more is a brownish-yellow or yellow, gravelly silt loam. The gravel is usually small and consists of both waterworn and subangular fragments of sandstone and shale. In some places the type contains a large quantity of cobblestones. Below the 3-foot section the material consists of stratified beds of gravel, sand, and silt.

Small areas of Chenango gravelly loam, Chenango gravelly fine sandy loam, and Tunkhannock gravelly silt loam,[1] occurring through the valleys of the county, are included with the Chenango gravelly silt loam in mapping on account of the difficulty of separation. The chief difference between the Chenango soils is in texture. The Tunkhannock differs from the Chenango mainly in having a

[1] *Chenango gravelly loam:* Brown, gravelly loam soil, 6 to 8 inches deep; yellowish-brown, gravelly loam to sandy loam subsoil extending to depth 24 to 36 inches; stratified beds of gravel and sand beneath; gravel mostly small and well rounded, derived from gray sandstone and sandy shales; surface level to undulating; drainage good.

Chenango gravelly fine sandy loam: Brown, gravelly fine sandy loam soil 6 to 8 inches deep; yellowish-brown, loose gravelly fine sandy loam subsoil, extending to 36 inches or more; sandy and gravelly substratum; gravel mostly from gray sandstone and sandy shales, small to medium in size, well rounded; surface level to undulating; drainage good.

Tunkhannock gravelly silt loam: Dark reddish brown, gravelly silt loam soil, 8 inches deep; reddish-brown or Indian-red, gravelly silt loam subsoil to depth of 36 inches or more; sandy and gravelly substratum; gravel and soil material mostly from red sandstone; surface level to undulating; drainage good.

strong reddish tinge in both soil and subsoil, imparted by the red sandstone and shale rocks from which it is largely derived.

The most important area of Chenango gravelly loam occurs 2 miles southwest of Greene, while smaller areas are found in the vicinity of Warn Lake, Brisben, and Read, and along Genegantslet Creek. The gravelly fine sandy loam is confined to small areas in the Susquehanna Valley near Bainbridge and East Guilford. Areas of the Tunkhannock gravelly silt loam lie along Lyon Brook in the town of Oxford, along Whites Store Brook in the town of Norwich, along Guilford Creek and the Unadilla River in the town of Guilford, and in the vicinity of Tyner.

The Chenango gravelly silt loam is one of the most extensive terrace soils in the county. It occurs along practically all the larger streams, but the largest areas lie in the Unadilla and Susquehanna Valleys. Some of the valleys seem to have been filled partly by till and partly by water-deposited material, and in some places these old deposits have been cut down or partly covered by till again. As a result, it is not always possible to separate all the till deposits, and small areas are included which might be more properly classed as Wooster than as Chenango.

The surface of the Chenango gravelly silt loam ranges from level to rolling, and owing to the mellowness of the surface soil and the open structure of the subsoil the drainage is good.

The original forest growth of white pine, hemlock, chestnut, maple, and oak has largely been removed, and the soil brought under cultivation. Timothy, clover, corn, and oats are the chief crops grown. Mixed timothy and clover hay yields from 1½ to 2 tons of hay per acre, and corn 10 to 14 tons of ensilage. Oats yield 35 to 50 bushels per acre. Alfalfa is grown successfully on this type, and wheat makes a good yield. Numerous small plantings of apples, cherries, and small fruits have been made, and all these fruits seem to thrive.

Some form of crop rotation is followed by most farmers on this soil. Both commercial fertilizer and stable manure are used, and a number of farmers are applying lime, with success. The buildings and fences are usually substantial and kept in good repair. Land values vary according to the location and the character of the improvements.

CHENANGO SILT LOAM.

The Chenango silt loam to an average depth of 8 inches is a light-brown to yellowish-brown silt loam. The subsoil is a brownish-yellow, friable silt loam. At 22 or 24 inches thin, stratified layers of fine sandy loam to very fine sandy loam are often encountered. Typical areas have no mottling within 3 feet of the surface, but in some

low areas and near the border of other types gray mottlings may appear at depths ranging from 18 inches to 2 feet.

This type has been formed from reworked glacial shale and sandstone material laid down by moving water. The topography is undulating to nearly level, and typical of terrace formations. The drainage is in most places thorough.

Small areas of Chenango silt loam are mapped along the larger streams of the county, with the largest ones in the Susquehanna Valley near Bainbridge and Afton.

This is an excellent agricultural soil, but it is of little importance owing to its small extent. It is used for the staple crops of the region. Hay, corn, and oats give good yields.

TYLER SILT LOAM.

The Tyler silt loam consists of a light-brown to grayish-brown silt loam, grading at 5 to 8 inches into a gray silt loam mottled in most places with yellow and rusty brown. Ordinarily this extends to a depth of 36 inches, but takes on a more ocherous-yellow and gray shade at 18 to 22 inches. The lower subsoil is usually coarser in texture, ranging from a very fine sandy loam to gravelly fine sandy loam.

There is considerable variation in this type, especially in color. The color of dry, plowed fields is gray, but when moist it becomes brownish gray. Below the first inch or two the uncultivated surface soil even when moist is rather light gray, somewhat resembling the subsurface material. Brown iron stains and here and there iron concretions are found in these areas. On some ridges or knolls, slightly higher than the surrounding country, the color is usually yellowish brown. The subsoil in these slightly elevated areas also contains more yellow than in the level areas, and the ocherous-yellow and brown iron stains are not so numerous. In general the poorer the drainage the grayer the color of both surface soil and subsoil. In some of the slight depressions the subsoil is a heavy silt loam or silty clay. The small area 5½ miles southwest of Greene is variable in texture, ranging from a silt loam to a light fine sandy loam. It contains a small quantity of rounded gravel over the surface and throughout the lower subsoil.

The Tyler silt loam has been formed from a deposit of alluvial material now occupying a terrace position along the valleys. The topography is level or gently undulating, and the drainage poorly developed.

This soil is not extensive in Chenango County. It is mapped along the Susquehanna and Unadilla Rivers in the vicinity of Bainbridge, South New Berlin, and Davis Crossing. The greater part of the

type has been cleared, and is used either for pasture or as hay land. Grain is sometimes grown. By means of underdrainage and liming this soil could be made to produce good crops of grain and grass.

FOX GRAVELLY LOAM.[1]

The surface soil of the Fox gravelly loam consists of 8 to 10 inches of rich-brown gravelly loam, underlain by lighter brown gravelly loam which rests upon beds of gravel at a depth of 2 or 3 feet. The gravel on the surface and in the upper part of the 3-foot section consists largely of sandstone and shale, but the underlying beds are largely made up of limestone. In many places the subsoil ranges toward a gravelly sandy loam in texture.

The Fox gravelly loam is extensively developed in the Chenango and Unadilla Valleys. It occupies benches or terraces lying above normal overflow, and represents alluvium brought down from the limestone regions to the northward by glacial streams. The typical areas have an undulating topography, but some areas are rolling to broken or morainic. Owing to the porous substratum, the drainage is excellent. The type ranges in elevation from 900 to 1,100 feet above sea level.

Practically all of this soil has been cleared and brought under cultivation. Dairying and general farming are the main industries. The whole milk is usually hauled daily to the shipping stations. The most important crops grown are hay, corn, and oats, supplemented by alfalfa, potatoes, wheat, and buckwheat. Clover yields from $1\frac{1}{2}$ to $2\frac{3}{4}$ tons per acre and timothy $1\frac{1}{2}$ to 2 tons. Two cuttings of clover are sometimes obtained. The corn crop is generally cut for silage, and yields 9 to 12 tons per acre. Oats yield 45 to 60 bushels per acre, potatoes 100 to 150 bushels, wheat 15 to 50 bushels, and cabbage 8 to 15 tons. Small orchards of apples, plums, cherries, and small fruits do well.

This soil is usually well managed. Crop rotations are followed, commercial fertilizer or stable manure is applied to the soil, and modern machinery is used. The farms are handled mainly with the object of producing forage for the dairy herd. The Holstein is the predominating breed of dairy cow. Many herds are composed wholly or in part of purebred stock or high-class grade animals.

The farm buildings on this soil are substantial, and equipped with modern, labor-saving machinery. The farms seem to be above the

[1] Quite a large proportion of the area mapped as Fox gravelly loam really represents a gradation toward the Rodman series, which is characterized by a rough topography. The soil here is largely of limestone origin, and was probably laid down by glacial streams, but the topography is more broken than is typical of the Fox terraces. It was not considered necessary to separate these soils in mapping, because of the slight difference in agricultural value.

average in productiveness and equipment, and the farming methods are above the average.

The price of this land ranges from $45 to $150 an acre, depending upon the location and improvements. The average price is about $75 an acre.

FOX FINE SANDY LOAM.

The Fox fine sandy loam consists of a brown fine sandy loam, 7 to 10 inches deep, underlain by a lighter brown fine sandy loam which extends to a depth of 36 inches. As a rule the subsoil rests upon stratified deposits of sand and gravel, of limestone origin. The texture is more or less variable, depending upon the velocity of the current where the soil was deposited. In several places, as about 1 mile south of Sherburne Four Corners, the soil varies toward a very fine sandy loam or silt loam, and is lighter colored than typical.

The largest areas of Fox fine sandy loam are mapped in the vicinity of North Norwich and Sweets, in the northeastern part of the county. The type occupies terrace positions, high above normal overflow, and drainage is well established.

Approximately 90 per cent of this soil is under cultivation. The general farm crops of the region are grown. Yields and cultural practices are about the same as on the adjacent terrace soils of similar character. The type is well adapted to such truck crops as cabbage, potatoes, and sweet corn.

Fox fine sandy loam, gravelly phase.—The surface of the Fox fine sandy loam, gravelly phase, consists of a brown to dark-brown, mellow, gravelly fine sandy loam extending to a depth of 8 or 9 inches. The subsoil to 36 inches or more is a lighter brown, or in places dark yellowish brown, gravelly fine sandy loam. The gravel is small, and that on the surface is composed almost entirely of sandstone, while the underlying material is composed largely of limestone gravel. In some places both the soil and subsoil have a reddish cast, especially when moist; this is probably due to the presence of disintegrated fragments of red sandstone or shale. In some areas the material is relatively coarse, grading to a sandy loam with a variable percentage of gravel on the surface and throughout the 3-foot section.

This is not an extensive soil in Chenango County. It is found in the Chenango and Unadilla Valleys, the largest areas being mapped in the vicinity of North Norwich, Brisben, and Sages Corners. The topography is undulating, and drainage is well established.

Practically all of this soil is under cultivation, mainly to corn, oats, and hay. Wheat, buckwheat, and cabbage are also grown. The yields are good, averaging about the same as on the other members of the Fox series in this county.

GENESEE SILT LOAM.

The surface soil of the Genesee silt loam is brown to light-brown, mellow silt loam, 7 to 9 inches deep. The subsoil is a light-brown, friable silt loam extending to a depth of 36 inches or more. The type is quite uniformly free from stones or gravel.

Areas of Holly silt loam too small to separate are included with this type in places, as also are two small areas of Barbour silt loam, one near Whites Store and the other near East Guilford. The soil in these areas is a rather dark reddish silt loam, 6 to 8 inches deep, resting upon a silt loam subsoil only slightly lighter in color.

The Genesee silt loam is of recent-alluvial origin. It consists very largely of reworked shale and sandstone material washed from the uplands and deposited along the streams. Areas associated with the Fox soils may be more or less influenced by limestone. The Genesee silt loam is well distributed throughout the valleys, especially along the larger streams. In general, the surface is almost level, but some relief is caused by low ridges and old stream channels. Drainage is ordinarily good, except during the periods of high water.

Most of this type has been cleared and put under cultivation. Parts of it are used for pastures. Hay, the most important crop, yields 1½ to 2½ tons per acre. Oats and corn are grown to a considerable extent, and give good yields. The small included areas of Barbour silt loam are used for hay or pasture land. The type is left in sod as long as possible. Grass is usually seeded with the oat crop. Applications of lime have resulted in increased yields, especially in the case of the hay crops.

The selling price of land of the Genesee silt loam varies according to the location, the adjoining soil types, and the productiveness, and ranges from $20 to $75 an acre.

HOLLY SILT LOAM.

The Holly silt loam consists of 6 or 8 inches of brownish-gray, mellow silt loam, underlain by gray or yellowish-gray, mottled silt loam. The surface and the entire 3-foot section are uniformly free from gravel and stone fragments. There are some variations from this typical description, the color of the soil being much darker in small low-lying areas and brown to light brown on slight ridges, the materials here approaching in color characteristics the Genesee or even the Chenango materials. These color differences are the result of difference in the degree of drainage.

The Holly silt loam is one of the most extensive first-bottom types in Chenango County. It is of recent origin and represents material washed down by the streams from the light-colored shale and sand-

stone uplands and subjected to poor drainage conditions. The largest areas are found along the Chenango, Susquehanna, and Unadilla Rivers. The surface is level, and the soil is poorly drained.

A small acreage of this type is cultivated, but the greater part is in permanent sod or pasture. The fall along many of the streams is so slight that drainage is difficult. If the areas occupied by this soil could be drained and protected from floods, they would prove valuable for crop production. Lime in some form should be applied before cultivation is undertaken.

HOLLY SILTY CLAY LOAM.

In its typical development the Holly silty clay loam consists of 4 to 8 inches of brownish-gray, heavy silt loam or silty clay loam, underlain by a gray and yellowish-brown, mottled silty clay loam. The lower subsoil is often a mottled gray or drab clay. The type varies considerably in both color and texture. In low, slightly depressed areas it may have a 2 or 3 inch covering of peaty or mucky material, or the surface may be dark gray to black, resembling the Papakating series. In other places the color tends toward light brown, resembling the Genesee silt loam.

The Holly silty clay loam is of alluvial or lacustrine origin. The areas bordering streams are strictly alluvial, but those occupying slight depressions were probably occupied by lakes. The topography is flat, and with the exception of Muck and Meadow, this type occupies the most poorly drained positions in the county. Unless drained, water stands on the surface the greater part of the year. Artificial drainage is difficult.

The Holly silty clay loam is mapped in the upper Chenango Valley and in the vicinity of Holmesville and Davis Crossing along the Unadilla River. Most of this land is uncultivated. Wild grasses and sedges make a rank growth and produce rough forage and pasturage. One small area has been drained and is used for grass land.

MUCK.

Muck differs markedly from other soils in being composed largely of decayed and decaying vegetable matter. Where the vegetable remains are still in a fibrous or only partially decomposed condition, so that they still retain their original structure and the material has a brown color, it is properly classed as Peat; while areas in which decomposition has advanced to such an extent that the fibrous nature is largely destroyed, resulting in a black, spongy mass, are classed as Muck. In Chenango County most of the areas mapped as Muck are really a peaty muck, in that the surface layer is well decomposed while

the lower stratum is still fibrous. Typical Muck is more generally found in this county in the shallower deposits.

The depth of the deposits varies from a few inches to several feet. Over most areas the depth is 2 or 3 feet, or even more, and much of the Muck is several feet in depth. The underlying material varies from sand or clay to glacial till.

The surface of the Muck areas is flat, and the material is usually saturated with water throughout most of the year. Artificial drainage is always necessary before the type can be used for agriculture.

There are only a few scattered areas of Muck in Chenango County. The largest lie in the towns of Preston, Plymouth, and McDonough. Smaller areas are scattered throughout the uplands and along the wider valleys.

Most of the type supports a growth of hemlock, elm, ash, tamarack, and swamp maple, with an undergrowth of rushes, marsh grass, and flags. A few areas have been cleared and produce coarse forage or afford some pasturage. None of the Muck is now cultivated. When drained and otherwise reclaimed this is a very valuable soil, particularly for special crops such as celery and onions. It can also be used for general farming, as it is capable of producing good yields of corn, buckwheat, potatoes. and other crops.

MEADOW.

Meadow is a term applied to small bodies of soil whose texture and drainage are so variable that separation into series or types is impossible. This class of material is found along drainage courses throughout the county, and usually represents land that is subject to overflow. Small, poorly drained areas throughout the uplands are also included in Meadow.

The material along the streams varies from light brown or gray to black, and if more extensive would be correlated in the Chenango, Genesee, Holly, or Papakating series. The texture ranges from silt loam to loam, with a variable content of stone or gravel. Some areas have a thin covering of Muck or Peat.

The Meadow mapped in the uplands has a dark-colored surface soil and a mottled gray and yellow subsoil. There is a variable quantity of angular rock fragments on the surface and throughout the 3-foot section. The type occurs in swales or depressions that are wet or have water standing upon them the greater part of the year. The large area about 2 miles east of East Pharsalia is fairly typical of the Meadow as mapped throughout the uplands. The surface soil is dark gray to black and the subsoil is mottled gray and yellow. Fragments, ranging in size from small cobbles to large slabs, of hard, gray sandstone, conglomerates, and here and there

red sandstone, are scattered over the surface. Some patches less than 3 acres in extent of Muck or Peat, with an organic layer 2 to 8 inches in depth, are scattered throughout this area, as well as ridges of typical Lordstown or Wooster soils. The topography is level or nearly so. If the soil were drained it might be classified with the Volusia or Trumbull series.

Small patches of Meadow are under cultivation. The timbered areas support a mixed growth of elm, hemlock, soft maple, and ash, while the cleared areas produce a rank growth of coarse grasses. Most of the Meadow is used for pasture, to which use it seems best adapted.

SUMMARY.

Chenango County, situated in the south-central part of New York, has a total area of 894 square miles, or 572,160 acres.

The surface varies from rolling to hilly. The elevation ranges from 900 to 1,950 feet above sea level. The county is well drained, except in some parts of the valleys.

Settlement was begun in this region in 1785, by people from New England. Immigration was rapid and the county was soon settled. The population in 1910 amounted to 35,575. The rural population is gradually decreasing.

Norwich, the largest town and the county seat, had a population in 1910 of 7,422. There are numerous villages and trading centers throughout the county.

Several steam roads furnish good transportation facilities. The highways are usually good, especially in the valley sections.

The winters in this region are long and cold, and the summers are short. The mean annual temperature is 44.5° F., and the mean annual precipitation 41.1 inches. The average length of the crop-growing season is 137 days.

Dairying and general farming are the main agricultural industries. Hay, corn, oats, and potatoes are the principal crops, hay occupying by far the largest acreage. Most of the milk is shipped to New York, but part is taken by local creameries, cheese factories, and condenseries.

Most farmers realize the value of crop rotations, but they do not follow any rotation systematically. Only a small amount of commercial fertilizer is employed, but large use is made of stable manure.

Nearly 80 per cent of the farms are operated by owners. Labor is high priced and scarce. The average size of the farms in 1910 was 126.6 acres, about two-thirds of which is improved land.

Land values in Chenango County range from $8 to $150 an acre. The average price for hill farms is about $20 and for the valley farms about $75 an acre.

The use of some form of lime is of fundamental importance in the improvement of practically all the soils of the county.

The soils of Chenango County are chiefly of glacial origin. The underlying rocks are sandstones and shales, and the soil material is composed almost entirely of disintegrated products of these and similar rocks to the north, brought southward by the ice. Eleven series, embracing 20 distinct soil types, in addition to Muck and Meadow, are mapped.

The principal upland soils, derived from light-colored shales and sandstones, are separteed according to depth of material and drainage into the Lordstown, Wooster, and Volusia series. The Lordstown stony silt loam and silt loam are well-drained soils of shallow depth. The Wooster stony silt loam, gravelly silt loam, and silt loam are well-drained soils representing deep deposits. The Volusia stony silt loam and silt loam are poorly drained. These upland soils are devoted mainly to dairying and general farming.

Upland soils derived from red sandstones and shale are separated according to drainage into the Lackawanna and Norwich series. The Lackawanna is a well-drained series embracing in this county two types—the stony silt loam and silt loam. The Norwich is a poorly drained series represented by the stony silt loam and silt loam types. The Lackawanna and Norwich soils make good grass land.

Deposits of deep till derived from sandstones and shale, together with a considerable admixture of limestone fragments, are classed in the Ontario series. One type, the gravelly silt loam, is mapped in Chenango County.

The river terrace soils are divided according to the source of the material and the drainage conditions. The high, well-drained terrace soils are separated into the Chenango and Fox series, and the poorly drained types into the Tyler series. The Chenango gravelly silt loam and silt loam represent material derived from light-colored shales and sandstones. The Fox gravelly loam and fine sandy loam, the latter with a gravelly phase, represent terrace deposits with calcareous subsoils. The Tyler silt loam is a poorly drained soil derived from sandstone and shale deposits.

The alluvial soils are divided into two series. The well-drained Genesee silt loam is a light-brown soil, while the more poorly drained Holly silt loam and silty clay loam are light gray.

Some small, poorly drained areas of Muck are mapped in various parts of the county.

Meadow consists of poorly drained material that it is impracticable to separate into types, owing to variability in color, texture, and structure.

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[PUBLIC RESOLUTION—No. 9.]

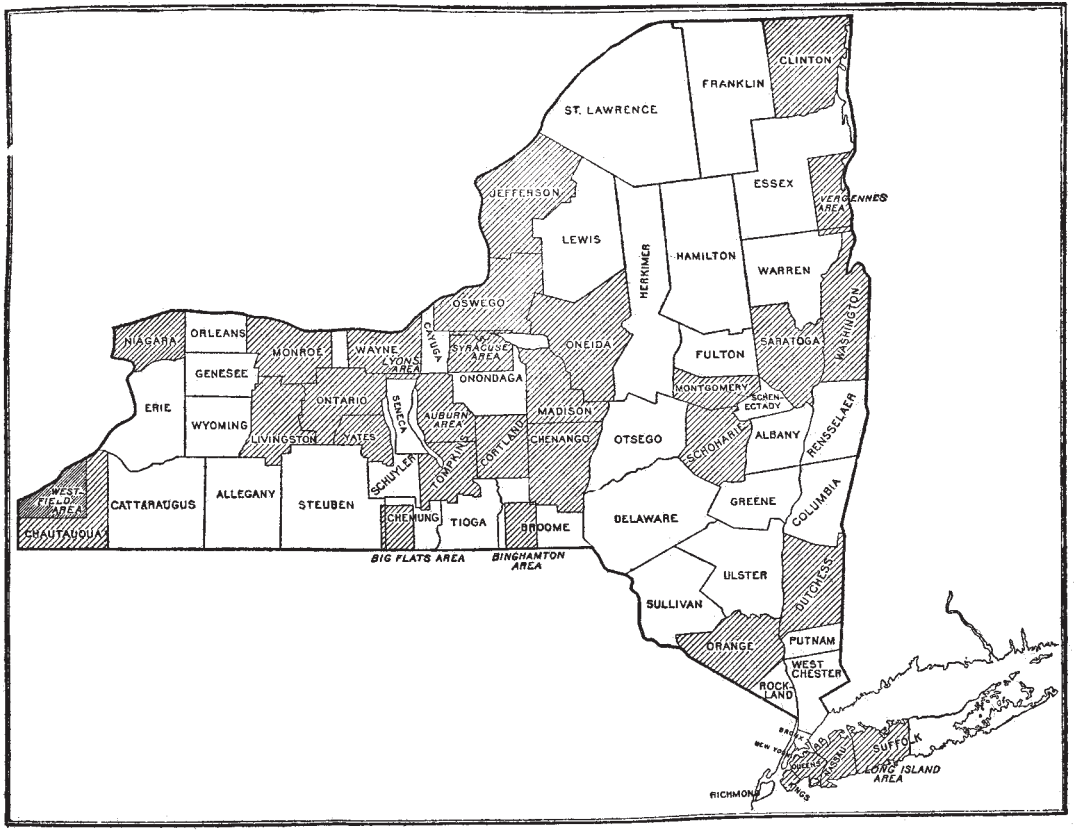
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in New York.

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