

SOIL SURVEY OF THE SYRACUSE AREA, NEW YORK.

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LOCATION AND BOUNDARIES OF THE AREA.

The Syracuse area is located in the northern central part of New York State, and included between parallels 43° and $43^{\circ} 15'$ north latitude and meridians 76° and $76^{\circ} 30'$ west longitude. The area embraces the northern part of Onondaga County and small portions of Oswego and Cayuga counties, representing a land surface of about 416 square miles, nearly half of which is high rolling hills, the other half being flat lands.

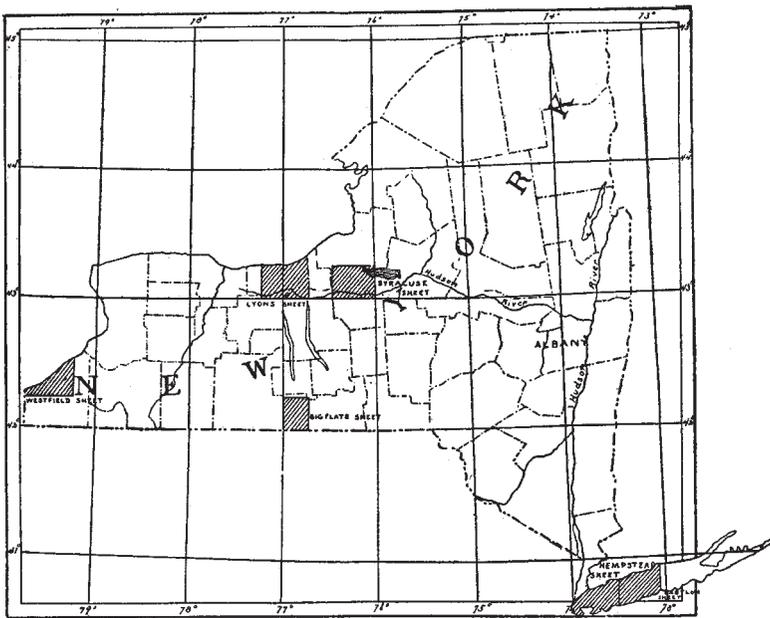


FIG. 2.—Sketch map showing location of the Syracuse area, New York.

Onondaga, Cross, and a part of Oneida lakes are included in the area, and it is traversed by three large navigable rivers—the Seneca, the Oneida, and the Oswego—and by the Erie and Oswego canals.

Syracuse, the county seat of Onondaga County, a thriving manufacturing city of some 115,000 inhabitants, is located in the southeastern part of the area. Small towns are numerous and well distributed, and the intervening country is thickly settled.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

At the close of the Revolution central and western New York was a wilderness covered with heavy forest growth, except for small fields cleared by the Indians, but the march of the armies had made known the future promise of this region, and the State and General governments immediately took steps to acquire ownership. The treaty of independence secured no terms to the Iroquois Indians. Their ancient possessions passed by that treaty into the hands of the United States. The new Government, desiring to secure peace with the Six Nations, made a treaty securing a large portion of land in western New York, and by a treaty with the Onondagas, concluded in 1788, the lands known as the "military tract" were acquired, and were afterwards organized into Onondaga County.

The early land grants provided that the territory should be laid off in townships of 60,000 acres, subdivided into 100 lots of 600 acres each. Six lots in each were reserved, one for support of the public schools and the church, one for promoting literature in the State, and the remaining four to compensate such as might in the original allotment secure land for the most part covered with water and for the surplus share of officers. The twenty-six townships of the military tract were designated by the names of distinguished men.

In 1794 Onondaga County was erected from the western part of Herkimer, and included the military tract which now forms all of Cayuga, Seneca, Cortland, Onondaga, and parts of Tompkins and Oswego counties. It was finally reduced to its present territorial limits in 1816, by the detachment of Cayuga, Cortland, and Oswego.

Onondaga County was the seat of the Indian nation from which it takes its name, the word meaning "men of the mountains." According to their tradition, the union of tribes was formed on the shore of Onondaga Lake, where the village of Liverpool now stands. The clearing and settlement of the territory was facilitated by the abundance of game, which furnished provision to the pioneers until the first crops could be raised. The old canal from Little Falls through Rome to Oneida Lake and the Oswego and Seneca rivers was a useful improvement in its day, and aided greatly in the settlement and development of the resources of this section.

The first survey for the Erie Canal was made in 1808. Delayed by the war of 1812, it was begun in 1817 and completed in 1825, and has been an important factor in the commercial development of the State.

The existence of the salt springs was known to the Indians before the advent of white men, but it appears they did not know their use until taught by the Jesuit missionary, Father Le Moyne, who visited them in 1654. The State acquired an ownership in common with the Indians in 1788, and, in addition, to a tract of land adjoining them,

which has been quite a source of revenue to the State. In 1795 the Indians relinquished their rights in consideration of an annuity.

The original forests were dense and the timber heavy. Large forests of white pine grew in the northern part of the county, chiefly to the north of the Helderberg Range, being found along its base, with a few scattering trees growing above the corniferous limestone. A few stump fences are all that remain of this once extensive forest. White cedar abounded in the swamps on the flat lands. Hemlock was very plentiful in almost every part of the county, but more so in the northern part. Tamarack, two varieties of spruce, hickory, basswood, maple, beech, and white and black oak also formed an important part of the forests. The original forests are swept away, and not enough remains for firewood, coal being in general use among all classes.

Wheat early became the great staple and money crop, and continued such until the opening of the western fields. Since then its production has steadily declined, till now a comparatively small acreage is grown. A large area has always been devoted to grass and pasture. With the introduction of alfalfa, stock raising and dairying have been stimulated, and grass is the chief crop over a large proportion of the area. Corn has held its important position since the first settlement of the territory, with a continually increasing acreage.

The cultivation of tobacco as a commercial crop was begun in 1845, a man skilled in its culture being brought from Connecticut for this purpose. In 1846, 10 acres were raised; in 1854, 471 acres, producing an average of 1,178 pounds per acre. In 1870, 1,225,440 pounds were produced in the county. The value of the crop in recent years has amounted to three-quarters of a million dollars annually, practically all of the crop being grown in the northern part of the county. The other chief crops of the area are of more recent introduction, and are considered elsewhere in this report.

CLIMATE.

The following table shows the normal monthly and annual precipitation for the Weather Bureau stations at Auburn, located a short distance southwest of the limits of the area, and at Baldwinsville, located near the central part. The former is a fair representation of climatic conditions for the upland portion, while the latter represents the conditions obtaining in the forelands.

It will be noted that the flat lands receive a larger annual rainfall, which is very evenly distributed, while differences in temperature are too slight to be of much effect. Nevertheless there are wide local variations, due to proximity to the Great Lakes, surface configuration, and air currents.

Normal monthly and annual temperature and precipitation.

Month.	Auburn.		Baldwinsville.		Month.	Auburn.		Baldwinsville.	
	Temper- ature.	Precip- itation.	Temper- ature.	Precip- itation.		Temper- ature.	Precip- itation.	Temper- ature.	Precip- itation.
	°F.	Inches.	°F.	Inches.		°F.	Inches.	°F.	Inches.
January	24.1	2.64	22.6	3.12	August.....	69.0	3.44	67.8	3.52
February....	25.0	2.29	24.0	3.35	September..	60.9	3.15	61.0	3.28
March.....	32.7	2.30	30.1	3.77	October.....	49.7	3.37	49.4	3.08
April.....	45.0	2.81	44.3	2.20	November..	38.3	3.28	38.0	3.63
May.....	56.5	3.42	56.1	3.59	December...	29.3	2.82	28.5	3.77
June.....	65.9	3.76	59.4	3.12	Year..	48.0	36.85	46.5	40.88
July.....	70.6	3.57	70.1	3.95					

PHYSIOGRAPHY AND GEOLOGY.

The area embraced within the present survey presents two distinct and widely differing groups of physiographic features, nearly equal in extent and roughly bounded by a line drawn diagonally from the northwest to the southeast corners of the quadrangles. The southwestern part consists of high, rolling hills and table-lands, presenting a rounded topography, with smooth contours characteristic of a glacial area.

The longer axes of the hills lie in a parallel direction, showing the direction of the ice sheet which shaped them, while narrow, groove-like valleys have been scoured out where the rock offered less resistance.

The larger valleys, with one exception, have an east and west direction, and were formed by the large volumes of water from the melting ice escaping along the glacial front when the ice sheet was stationary for some time, and formed the north bank of these rivers, which found an outlet to the east into the Mohawk Valley. The south banks are marked by outcrops of limestone and underlying shales, washed bare by the strong currents, and by concave bluffs formed by eddies and turns in the currents.

The most noticeable of these valleys extends across the area from Jordan to East Syracuse, with little variation in elevation, and is utilized both by the canal and the railroads throughout its length. Drainage is very deficient, and Swamp and Muck occupy most of the surface, while a calcareous marl underlies nearly the entire extent. Alloway clay is also represented, and small areas of Miami silt loam, while Miami gravelly loam and Miami loam extend into it from small valleys adjacent.

The hill lands give rise to Miami stony loam, and are very generally well drained. The soil in the narrow valleys is deep and fertile, being augmented by wash from the slopes.

The northeastern part of the area is flat, and barely rolling enough to permit of drainage. This flat land constitutes part of what is known as the "great level," which extends along the south side of Oneida Lake to the base of the hills, being in part the floor of an old

glacial lake and in part Lake Ontario's forelands. It has but slight range in elevation, and numerous depressions are occupied by Swamp and Muck, through absence of natural drainage. The Cicero Swamp is the largest of these areas.

The soils over this division, as a rule, are lighter than on the hill lands, consisting in greater part of sands, sandy loams, and light gravelly loams. The lowest positions are occupied by the heavier alluvial soils deposited in quiet water under uniform conditions, and giving rise to the Alloway clay type. The higher elevations are occupied by the lighter types.

The Seneca River flows through the flat lands with a fall of less than 20 feet in crossing the entire area; and although the channel is deep and navigable to boats of considerable size, but little erosion took place during its establishment, and no flood plain of appreciable size was built up in this section, the surrounding soil types running sharply to the river banks. It is joined by the Oneida River at Three River Point, and from that point is known as the Oswego River.

Oneida Lake lies partly within the area, on the northeastern corner. Onondaga Lake is included in the area, and Cross Lake lies almost wholly within the sheet on the western boundary. All are navigable and furnish cheap transportation in connection with the canals and rivers.

The soils, with the exception of Penn clay, are either wholly or in part of glacial origin, or derived from reworked glacial material. The underlying rocks outcrop in many places, and are of interest mainly for the part they played in furnishing the materials from which the soils have been largely derived. Of the New York system of rocks the Clinton group, Niagara limestone, Onondaga salt group (Salina shales), water lime group, Oriskany sandstone, Onondaga, corniferous, and Seneca limestones, Marcellus shales, and the Hamilton group outcrop in this area.

SOILS.

Thirteen types of soil, including Swamp and the relatively unimportant type of Made land, are found in the Syracuse area.

The extent of each of these types is shown in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Miami stony loam.....	78,464	29.5	Miami loam	9,728	3.7
Miami silt loam	41,536	15.6	Penn clay.....	3,840	1.4
Miami gravelly loam.....	39,424	14.8	Alton stony loam	3,712	1.4
Alloway clay	24,832	9.3	Madeland.....	576	.2
Miami fine sandy loam.....	19,968	7.4	Warners loam.....	128	.1
Muck.....	16,960	6.4			
Miami fine sand.....	14,528	5.5	Total.....	266,176
Swamp	12,480	4.7			

ALTON STONY LOAM.

The soil of the Alton stony loam is a gray or brown sandy loam, sometimes containing a fair proportion of silt, but more often decidedly sandy in character. In depth it averages 10 inches and it contains a large percentage of stone and gravel of all sizes.

The subsoil to a depth of more than 3 feet is a yellowish-brown sandy loam, lighter in texture than the soil, underlain by gravel and sand at varying depths.

Its principal occurrence is along the walls of Onondaga Valley and in the northeastern portion of the city of Syracuse. One small area is found east of Jordan, also on a valley wall.

It occupies steep slopes and pointed hills, and exists in this area in narrow bands. Laid up against the higher hills of Miami stony loam, its topographic features are very noticeable, consisting of a series of rounded hills of equal elevation.

Surface drainage is very complete. Only small streams cross the type, and these, having considerable fall, are swift. The underdrainage is also adequate, from the nature of the soil and the underlying materials, and no artificial drains are necessary.

The Alton stony loam is derived from glacial material but slightly modified since its deposition through the agency of the ice sheet. The main area appears to be a remnant of a lateral moraine, most of which has been carved out by post-glacial waters, leaving this remnant high on the valley walls. The materials consist of boulders, gravel, sand, and silt in great confusion and ranging in rapid succession and within short distances from clear sand and silt to a mass of boulders and gravel with little or no interstitial material. Small areas exist as drift-covered drumlins showing marked glacial characteristics. The soil is usually thin and poor, but the finer particles have been well weathered.

Most of the type is too steep for cultivation and is used exclusively for pasture; still more lies well within the city limits and is not used for agricultural purposes. The small area cultivated is devoted to general farming and gardening. Truck crops do fairly well with heavy fertilization.

Alton stony loam is an unproductive and undesirable soil, but fortunately is not of great extent in this section and but little required for agricultural purposes, being well located and nicely suited for building and manufacturing uses in the city.

The following table shows the texture of typical samples of the fine earth of this type:

Mechanical analyses of Alton stony loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
9193	1 mile S. of Oak-wood.	Brown sandy loam, 0 to 12 inches.	P. ct. 0.78	P. ct. 3.72	P. ct. 13.50	P. ct. 13.22	P. ct. 37.00	P. ct. 9.76	P. ct. 3.18	P. ct. 19.62
9194	Subsoil of 9193....	Brown sandy loam, 12 to 36 inches.	P. ct. 1.15	P. ct. 2.10	P. ct. 8.30	P. ct. 11.26	P. ct. 48.58	P. ct. 11.00	P. ct. 2.90	P. ct. 15.70

NOTE.—The following sample contained more than one-half per cent of calcium carbonate (CaCO₃): No. 9193, 4.98 per cent.

PENN CLAY.

The soil of Penn clay varies from 3 to 8 inches in depth, with an average of 6 inches, and is a heavy reddish-brown or dark-red clay loam.

The subsoil is a stiff red or slightly mottled green and red clay, somewhat friable when dry, underlain at from 12 to 40 inches by red and green shales, which often outcrop and are bare of soil covering on steep slopes. It is a close-textured, cloddy soil, difficult to till, and subject to much erosion on the slopes. The more level areas have accumulated a deeper soil covering and are better adapted to agricultural use.

Shale fragments to the amount of from 5 to 10 per cent are often present on the surface and mingled with the soil and subsoil.

It occurs in small areas, usually on the slopes of hills, and is very conspicuous because of its brilliant color. The largest areas are west of Cross Lake, south of Plainville, and at Baldwinsville, but it is found through the central portion of the area in many detached spots. It occupies steep slopes and inclined tablelands and points of hills swept bare by the post-glacial waters. It is nowhere of sufficient extent to exhibit any characteristic surface features.

Most of this type is well drained, because of its inclined position and the open character of the underlying rock, but the soil and subsoil are very impervious and retentive of moisture.

Penn clay is remarkable here as being a distinctly residual soil in the commonly accepted meaning of the term and occurring in a glaciated area, it being derived from a weathering of bed rock in place, which in this case is the red and green Salina shales of Silurian

age. These rocks occur in a broad belt extending across the area in an east and west direction, and are mainly covered with glacial and more recent sedimentary material, the Penn clay being developed only where the glacial and alluvial covering has been removed.

The greater part of this type is used for pasture, but where the soil is deepest it is used for general farming and tobacco. Yields of tobacco are large, but the leaf is thick and heavy and brings a comparatively low price. Fair crops of grass, corn, oats, and wheat are grown. The soil is said to give large yields of wheat when it can be brought into proper condition for planting. It is best suited to wheat and grass. Heavy applications of lime would be of benefit in improving its texture.

The following table gives mechanical analyses of typical samples of the fine earth of the Penn clay:

Mechanical analyses of Penn clay.

No.	Locality.	Description.	Organic matter.							
				Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.06 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
9229	4 miles W. of Baldwinsville.	Red clay loam, 0 to 6 inches.	1.94	1.96	7.10	5.50	11.52	10.02	22.90	40.62
9231	1 mile W. of Manlius.	Heavy clay, 0 to 6 inches.	1.82	.52	2.60	2.50	6.70	7.30	21.40	58.60
9230	Subsoil of 9229.....	Heavy red clay, 6 to 18 inches.	1.06	2.00	7.00	6.20	11.96	8.98	19.00	44.40
9232	Subsoil of 9231.....	Stiffred clay, 6 to 22 inches.	1.46	.70	4.36	3.90	9.12	8.12	23.10	50.68

ALLOWAY CLAY.

The soil of Alloway clay varies in depth from 4 to 9 inches, with an average of 6 inches, and is a gray or brown silty clay loam, free from stones and gravel, and seldom containing any appreciable amount of sand. The subsoil to more than 3 feet is a mottled gray, brown, and yellow clay, sticky when wet, but somewhat friable when dry. The soil is lumpy and difficult to till.

This soil occupies a large area between the Oneida River and Lake Oneida, extending from the town of Clay beyond the northern limits of the area. Smaller areas are found bordering many swamps and small streams in the lowlands.

Alloway clay is marked by level or gently inclined surface features,

and rarely reaches to any considerable elevation. It may pass into any of the other types at high elevations, but usually grades into Muck and Swamp at lower elevations. It is quite generally associated with the Miami silt loam, and in physiographic position and drainage conditions seems to bear about the same relation to that type that the Elkton clay does to the Norfolk silt loam in the Coastal Plain sediments.

Its generally level surface, low-lying position, and close texture combine to make this a poorly drained, cold soil. Only the higher-lying portions come into tillage condition early enough in the season to make them available for the general crops. Most of the type is in need of underdrainage and heavy applications of lime to fit it for general agriculture.

Alloway clay is of sedimentary origin from glacial material, and represents a uniform condition of deposition from quiet waters. It consists of the finest particles represented in this area.

Weathering has taken place to a comparatively slight extent since its deposition, owing to its moist condition and consequent protection from atmospheric agencies of decay. The soil covering is shallow, in many cases being less than 4 inches in depth, and differs but slightly from the underlying subsoil.

A large percentage of this type is devoted to the production of hay, to which its heavy texture and large moisture capacity are well suited. The average yield is $1\frac{1}{2}$ tons per acre from year to year, but in favorable seasons 3 tons is a not uncommon crop in the best locations. Oats is the only other crop of importance grown, and yields of from 30 to 60 bushels are reported. A small acreage of corn, potatoes, and buckwheat is grown on some of the more favorable positions.

It is to the production of grass that the Alloway clay is best suited, and this peculiar fitness of soil to crop has been well recognized. It is also well suited to the small grains in dry seasons when the ground can be brought into condition early enough for planting. The moisture capacity of the subsoil enables crops to withstand any ordinary drought, but the growing season for the grains is so short in this climate that early planting is essential to success. For this reason the soil can not be relied upon with sufficient certainty to render their production profitable. Underdrainage, where practicable, would better fit this refractory soil for a wider range of crops and tend to make profitable yields more certain.

The following table gives mechanical analyses of typical samples of this soil:

Mechanical analyses of Alloway clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
9191	2 miles W. of Cicero.	Silty clay loam, 0 to 6 inches.	1.19	2.30	6.82	4.40	8.94	8.58	35.16	33.72
9189	2 miles E. of Collamer.	Silty clay loam, 0 to 8 inches.	1.40	.00	.24	.44	3.64	6.42	32.14	56.46
9187	1½ miles NE. of Warner.	Brown heavy clay loam, 0 to 6 inches.	4.32	.22	.38	.36	1.96	3.66	33.50	59.50
9190	Subsoil of 9189.....	Heavy silty clay, 8 to 36 inches.	.75	.24	1.04	.86	3.50	6.66	55.20	31.54
9188	Subsoil of 9187.....	Heavy silty clay, 6 to 36 inches.	3.37	Tr.	1.14	1.58	7.24	9.70	46.18	33.18
9192	Subsoil of 9191.....	Stiff silty clay, 6 to 36 inches.	.65	.38	.98	1.20	5.40	6.82	35.00	50.20

MIAMI SILT LOAM.

The soil of the Miami silt loam varies from 8 to 14 inches in depth, having a general average of 10 inches, and consists of a light-brown or yellow silt loam containing a varying proportion of very fine sand. It is a mellow, easily tilled soil, free from stone and gravel, and does not contain any appreciable amount of medium or coarse sand.

The subsoil from 10 inches to more than 3 feet is a light-yellow or mottled gray, brown, and yellow loam, containing a large amount of very fine sand in the upper portion, and usually becoming heavier and siltier in lower depths, but occasionally underlain below 3 feet by very fine yellow sand. The bulk of the sand content of this type appears to be micaceous rather than siliceous in character.

This type occurs in a large area in Cicero Township on the gentle slope toward Oneida Lake and in a broad belt along Seneca, Oneida, and Oswego rivers. Smaller areas occur near the Cicero Swamp and in the level valley traversed by the Erie Canal.

Miami silt loam is distinctly a flat-land type, and its surface features present a level, slightly inclined, or only gently undulating topography. In elevation it ranges from a little less to a little more than 400 feet above tide level, grading into Alloway clay and Muck at the lower elevations and rising into slight ridges of Miami gravelly loam, Miami fine sand, and Miami fine sandy loam. These higher-lying types have been deposited by more turbulent waters.

Its mellow character and porous texture insure an easy passage for water, and almost all of the type is naturally a well-drained, early soil, very little being so wet or close textured as to require artificial drain-

age. The great depth of the materials forming the subsoil aids materially in the natural drainage.

It is of sedimentary origin, deposited by lakes and streams existing after the final recession of the ice sheet, and consists of a fine sediment of glacial material worked over by the large volume of water consequent on the melting of the ice. The color and mellow condition of the soil give evidence of considerable weathering since its deposition. But little stream erosion has taken place, and surface configuration has been but slightly modified since the final subsidence of the waters. Even the large rivers which traverse this type have nowhere built up a flood plain large enough to be shown on a map of the scale used.

Hay, oats, corn, tobacco, potatoes, and truck are all important crops on this type. Hay yields from 1 to 2 tons per acre, but the soil is a little light to render large yields certain. Oats produce from 30 to 60 bushels and corn from 40 to 70 bushels, but the type is best adapted to potatoes, tobacco, and truck. Potatoes average from 100 to 350 bushels per acre, and larger yields are grown with heavy fertilization. It is well suited to the production of the filler tobacco of the area, and yields from 1,000 to 1,800 pounds per acre. Some of the lighter areas produce a smaller yield of thinner texture and lighter color, containing a larger proportion of leaves suitable for wrapper purposes. Cabbage, cucumbers, and other truck crops are grown with profit. Apples and other fruits do well.

Farms on this type are small, and a great deal of it is necessarily devoted to general farming, to which it is not so well adapted as the heavier types. Scarcity of labor, destructive hail storms, and low prices in late years have combined to reduce the acreage of tobacco.

The texture of the Miami silt loam, as shown by mechanical analyses, will be seen in the following table:

Mechanical analyses of Miami silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
				P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9197	Cicero Center.....	Yellow silty loam, 0 to 10 inches.	2.76	0.36	0.70	0.70	4.40	22.66	59.52	11.20
9199	4 miles N. of Liverpool.	Brown silty loam, 0 to 12 inches.	2.31	.24	.64	.62	2.62	24.82	52.60	18.54
9195	1½ miles E. of Warners.	Brown silty loam, 0 to 8 inches.	4.13	.00	.76	.48	4.16	15.26	58.20	20.90
9198	Subsoil of 9197.....	Yellow loam, 10 to 36 inches.	1.22	.00	.10	.28	1.70	21.42	68.16	7.76
9200	Subsoil of 9199.....	Brown loam, 12 to 36 inches.	.77	.00	.80	.80	4.72	38.60	41.20	14.30
9196	Subsoil of 9195.....	Brown silty loam, 8 to 36 inches.	.91	.00	.00	.18	1.50	12.28	58.78	27.20

NOTE.—The following sample contained more than one-half per cent of calcium carbonate (CaCO₃): No. 9198, 1.55 per cent.

MIAMI LOAM.

The Miami loam consists of a dark-brown silty loam soil varying from 8 to 14 inches in depth, with a general average of 10 inches, sometimes holding a small amount of fine sand, and usually very free from stone or gravel, except adjoining the Miami gravelly loam. The subsoil, from 10 inches to 3 feet, is a yellowish or brownish-yellow heavy silt loam to clay loam, occasionally slightly mottled at from 24 to 30 inches, and often underlain by gravel at depths greater than 3 feet. Although heavy in texture, the surface soil is usually mellow and friable and easily tilled. The proportion of very fine sand plays an important part in modifying its texture.

This soil occurs principally in the southeastern part of the area surveyed in comparatively large and uniform bodies, while smaller areas are found along the minor streams in the high, rolling uplands, where it presents a sharp contrast to the surrounding types.

The Miami loam occupies the bottoms of the small water courses, forming their latest and lowest terrace, and is usually adjacent to Miami gravelly loam, which rises in a higher terrace or grades directly into the Miami stony loam of the high hills. Its absence along the rivers of the area is very noticeable, and it is confined principally to the streams traversing areas of Miami stony loam. Its topographic features are very uniform, presenting a level or only gently inclined surface, unbroken by knolls or sudden changes in elevation.

The heavy texture and low-lying position of most of the type combine to make this a naturally wet and poorly drained soil. Much of that lying along streams is subject to overflow, and a greater portion requires underdrainage to remove surplus moisture and permit the land to be brought into condition for planting sufficiently early in the season. Overflows can not be entirely avoided, and crops are not safe until the time of spring freshets is past. These freshets add a surface of silt, however, and serve to maintain the productivity of the soil.

The Miami loam is of recent alluvial origin, derived mainly from the finer particles washed from the higher lying stony and gravelly loams and is being deposited with every freshet when the small rapid streams which traverse this type are swollen and spread out in thin sheets, depositing their load of silt over the flood plain, while the gravel and coarser particles are carried farther down and do not rise above the normal bank of the stream.

On account of its wet nature a large part of the type is used for pasture, but the higher lying portions are cropped to corn, wheat, and grass, and make a desirable, heavy, general-purpose soil capable of producing large yields. A considerable part of the type near the city is used for market-gardening purposes. Corn yields from 50 to 100 bushels of grain in the ear, wheat from 15 to 25 bushels without

fertilization, and grass will produce 1½ to 3 tons of hay per acre. Corn and grass are the principal crops, but considerable truck and canning crops are grown in situations favorable to market.

Of all these crops the Miami loam is best suited to wheat, corn, sugar beets, and grass—crops requiring a large moisture supply and long growing season. It is not so heavy as to prevent an adequate moisture circulation, and yet is capable of maintaining a sufficient supply for any ordinary crop and to withstand considerable drought. Underdrainage would make a larger acreage of this type available for general farm purposes and insure safer cropping.

The following table shows the texture of typical samples of this soil type:

Mechanical analyses of Miami loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9203	1 mile N. of East Syracuse.	Brown silty loam, 0 to 10 inches.	6.81	0.00	0.48	0.42	3.58	34.20	45.52	15.80
9201	Belle Isle.....	Brown silty loam, 0 to 14 inches.	2.96	.20	.90	.84	4.04	21.70	49.80	22.46
9204	Subsoil of 9203.....	Yellow silty loam, 10 to 36 inches.	1.34	.00	.60	.34	1.46	37.70	41.52	18.20
9202	Subsoil of 9201.....	Silty clay loam, 14 to 36 inches.	1.83	.00	.28	.52	2.80	14.00	53.02	29.40

MIAMI FINE SANDY LOAM.

The soil of Miami fine sandy loam is a dark-brown fine sandy loam to an average depth of 10 inches, but varying from 8 to 14 inches, underlain to more than 3 feet by a subsoil of light-brown, yellow, or occasionally gray sand, usually loamy. In small low-lying areas and adjoining swamps the surface soil becomes quite black, and in such cases the subsoil is generally gray.

The soil of most of the type is uniformly brown, with a lighter colored subsoil, usually having a small percentage of gravel on the surface and through soil and subsoil, but large areas exist which are quite free from stones and gravel. Fine sand and silt are the predominant features of its texture, making it mellow and loamy through a wide range of moisture conditions.

It occurs in broad, irregular areas and narrow belts in both highlands and lowlands, but is best developed in the large foreland areas around Jacksonville, Baldwinsville, Liverpool, and Clay, and along

Butternut Creek. The narrow highland areas are usually wet and low lying, and do not well represent the type.

It ranges from level or sloping to gently undulating in topography, and is principally a flat land type, with comparatively slight range in elevation. The flat areas usually border areas of Muck and Swamp, while the more rolling areas generally occur around the gravel ridges, especially on their northern extremities. The slopes are nowhere steep, and the entire area of the type lies in advantageous position for cultivation.

Natural drainage features vary widely on this type; position and texture both favoring adequate drainage in the higher-lying and rolling portions, while the low-lying position of part of the type, in spite of favorable texture, precludes drainage, and these portions are usually wet and in need of artificial drainage to better fit them for tillage.

Miami fine sandy loam is for the most part of sedimentary origin, being made up of glacial material reworked and deposited by lake and stream action, representing a condition midway between those which gave rise to the Miami fine sand and the Miami silt loam. The surface soil has been largely modified since deposition by the incorporation of organic matter during a long period of cultivation, and in the swampy areas by the accumulation of partially decayed vegetable matter from the rank growth which it supports, and these areas grade into Muck, where the accumulation has been excessive.

The subsoil has undergone little change except through weathering in the better drained portions. Several small areas in slight valleys between the high rolling hills are of different derivation, owing their origin to wash from the hillsides and deposition of the coarser particles from small streams when swollen by heavy rains. These areas are small and of little importance.

This type is largely under cultivation to general farm crops, tobacco, truck, potatoes, and small fruits. The last three are successfully grown and form the money crops. Yields of the general crops are a little light to render this soil thoroughly desirable for general farming. Wheat will average 12 or 15 bushels per acre, oats 30 or 40 bushels, hay from 1 to 1½ tons, corn from 50 to 80 bushels in the ear. In good seasons and under good management corn may be made to produce 100 bushels, but such yields are rare. Small fruits, peaches, plums, apples, pears, and cherries are well suited to this soil. Potatoes yield from 100 to 200 bushels per acre, and a great variety of truck and canning crops is successfully grown.

It is in the production of tobacco that this type is most favorably known, and it is well suited to the grade of leaf produced in this section. Yields range from 1,000 to 1,800 pounds per acre, 1,200 pounds being a fair average. The better drained portions alone are adapted

to this crop. In percentage of wrappers this type ranks next to the Miami fine sand, but is closely approached in this respect by the lighter portions of the Miami gravelly loam.

Miami fine sandy loam is best suited to tobacco, truck, and small fruits, which should receive more attention, and a less acreage should be devoted to the heavier farm crops, of which only fair yields are in most cases to be expected. Potatoes are well suited to this soil, and the average yield might be largely increased by careful cultivation.

The following table gives mechanical analyses of typical samples of the soil and subsoil of the Miami fine sandy loam:

Mechanical analyses of Miami fine sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9227	¼ mile N. of Jacksonville.	Fine sandy loam, 0 to 11 inches.	4.02	0.54	1.00	1.38	20.82	33.30	32.60	10.40
9225	2 miles E. of Cicero.	Fine sandy loam, 0 to 10 inches.	1.57	.24	1.64	2.84	19.86	33.82	29.80	11.30
9223	¼ mile NE. of Belle Isle.	Fine sandy loam, 0 to 12 inches.	4.58	.10	.58	1.12	10.20	38.70	35.60	13.58
9228	Subsoil of 9227.....	Yellow sandy loam, 11 to 36 inches.	1.11	.16	.72	1.04	18.24	35.40	36.10	7.50
9226	Subsoil of 9225.....	Fine sand, 10 to 36 inches.	1.24	1.04	2.12	3.30	20.26	38.48	23.04	11.28
9224	Subsoil of 9223.....	Fine sandy loam, 12 to 36 inches.	1.36	.00	.28	.34	5.18	49.34	30.66	14.20

MIAMI FINE SAND.

The soil of Miami fine sand varies from 6 to 12 inches in depth, and is a light-brown or reddish loamy fine sand, usually free from stones and gravel. It is by far the lightest soil of the area, and resembles the Hartford sandy loam of the Connecticut Valley in texture and adaptation. The subsoil to a depth of more than 3 feet is a fine yellow or orange sand, becoming gray in the lower depths in some instances, and always loose and incoherent.

It occurs in a large level area bordered by dunelike hillocks, extending from Ley Creek northward to the smaller Cicero Swamp. Gravelly ridges are found through this area, and the slight depressions are filled with Muck. Extending from the north shore of Onondaga Lake through Oak Orchard, and in a northerly direction beyond the limits of the present survey, a long, broken ridge of this type occurs. Narrow ridges and isolated hillocks are found throughout the forelands.

Miami fine sand occupies level and gently rolling positions and is found on ridges of slight elevation above the surrounding types. Small dunes are usually found bordering any material changes in elevation. It is nowhere so steep as to interfere with easy cultivation. Its elevation extends but little above 400 feet, the greater proportion of the type lying at that elevation.

From its porous and friable texture and the usual great depth of the sandy subsoil, it is everywhere a thoroughly drained, warm, early soil, requiring no artificial drainage, and in fact not capable of maintaining a sufficient moisture supply for the need of many crops.

The Miami fine sand is derived from reworked glacial material deposited as lake or stream sediments, and represents a moderately quiet current deposition of considerable uniformity. Doubtless the red sandstones so abundant farther to the north furnished most of the material which gave rise to this type. Owing to the nature of the mineral particles which make up this type, weathering has produced but slight changes in its character. The soil being porous in character and well drained, the iron salts are in a high state of oxidation, which gives the type a brighter color than is usual in glaciated areas, the bright orange subsoil being in great contrast to the usual dull browns and grays exhibited by the surrounding types. The color of the soil has been much modified by the incorporation of organic matter incident to long cultivation and cropping. No streams of any size occur in this type and no erosion is evident.

Tobacco, truck, potatoes, and small fruits are the chief crops, and produce good yields of fine quality. The tobacco grown on this soil is thinner, brighter colored, and yields a higher percentage of leaf suited to wrapper purposes than on any other soil of the area. Yields vary from 1,000 to 1,800 pounds per acre, but the lighter yields are more general, on account of the thinness of the leaf. However, the crop averages slightly higher in price than that grown on the other tobacco-producing types of this locality, which compensates for the smaller yield.

Potatoes yield from 100 to 300 bushels per acre of smooth, uniform-sized tubers, but heavy fertilization is necessary to secure the higher yields. Tomatoes, melons, and other light truck and market-garden crops are successfully grown on the Miami fine sand. Peaches, plums, and pears produce fruit of superior color and flavor. Miami fine sand is well suited to a wide range of truck crops. Because of the small average size of farms, considerable of the type is devoted to general farming, although not suited to grass and grain crops. Wheat yields 10 bushels, oats from 20 to 30 bushels, and hay 1 ton per acre. Corn yields fair crops in wet seasons and under conditions which would be adverse on the heavier types.

It is in the production of tobacco, truck, and small fruits that Miami fine sand reaches its highest efficiency, and it is to improved methods and higher quality of production in these crops that the agriculturist must look for increased profits. The use of any considerable proportion of this type for general farming is of doubtful economy, and a larger acreage should be devoted to special crops under a more intensive system. Fertilization and rotation should also receive more attention than at present.

The texture of the Miami fine sand is shown by the mechanical analyses given in the following table:

Mechanical analyses of Miami fine sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.		Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	
9221	1 mile NW. of Woodard.	Brown fine sand, 0 to 8 inches.	1.58	0.38	0.60	1.30	33.72	40.50	17.68	5.76	
9219	3 miles W. of Phoenix.	Brown fine sand, 0 to 10 inches.	2.37	.52	1.42	3.86	35.88	42.34	9.50	6.60	
9217	3 miles NW. of Colamer.	Brown fine sand, 0 to 9 inches.	3.92	.44	3.86	16.88	57.12	6.50	6.30	8.00	
9222	Subsoil of 9221.....	Very fine sand, 8 to 36 inches.	.15	.00	.00	.50	32.64	52.88	10.40	3.54	
9218	Subsoil of 9217.....	Fine sand, 9 to 36 inches.	1.57	.24	3.52	18.48	63.82	6.42	3.48	4.14	
9220	Subsoil of 9219.....	Yellow fine sand, 10 to 36 inches.	.72	.22	1.30	3.04	37.86	44.58	8.58	4.20	

MIAMI GRAVELLY LOAM.

The soil of Miami gravelly loam varies from 9 to 15 inches in depth, averaging 10 inches, and is a brown or reddish-brown more or less sandy loam. In appearance it much resembles the stony loam of the same name, but the gravel present is more uniform in proportion and more rounded, giving evidence of reworking and transportation by water, and the texture is uniformly lighter and more sandy.

The subsoil from 10 to 36 inches is either a yellowish, sticky sandy loam or red sandy clay, the former phase predominating, underlain at from 12 inches to 6 feet by beds of stratified gravel and cross-bedded sand. From 20 to 60 per cent of rounded and subangular gravel and stones up to 8 or 10 inches in diameter are scattered irregularly on the surface and throughout the soil and subsoil. These fragments are principally fine-grained red sandstone, with some limestone and igneous rocks. The sand content is medium to fine grained, and the proportion varies greatly in different areas. A few areas near Oneida

Lake are more properly a modified beach gravel, but correspond so nearly in texture and crop interests that they have been included in this type.

Miami gravelly loam ranks next to the Miami stony loam in point of extent in this area, and occurs in both highlands and forelands, occupying a low elevation in the former and the highest elevations in the latter positions. The highland areas are long, narrow terraces in the larger valleys, while the lowland areas are mostly oval in shape and of regular outline.

Miami gravelly loam varies from a level or slightly inclined to gently rolling topography, the more level areas being stream terraces in the larger valleys of the uplands, where it occupies a position just above the Miami loam and below the other upland types. It is never so steep as to interfere with cultivation, and varies from a little below 400 feet to something over 500 feet in elevation above tide level.

Throughout the area it is a uniformly well-drained early soil—a condition brought about both by its porous texture and rolling topography—and none requires artificial drainage.

The Miami gravelly loam is sedimentary in origin, derived from reworked glacial material which was deposited as stream terraces at the close of the glacial epoch, when the large volumes of water escaping from the melting ice were transporting the coarse materials present in this type. The foreland areas occur as bars in a former lake region, and were likewise laid down when the volume of water and the transporting currents were greatest. In this phase of occurrence, therefore, it occupies the highest position.

The principal crops are corn, tobacco, potatoes, truck, oats, wheat, and grass. Corn does well, and yields from 50 to 80 bushels per acre, comparing favorably with the yields of this crop on any other soil of the area. Tobacco yields from 900 to 1,600 pounds per acre, with an average yield of 1,000 to 1,200 pounds, much depending on local conditions, fertilization, and care. Potatoes yield from 50 to 250 bushels per acre, with an average yield of 100 to 150 bushels. Tomatoes, cabbage, cucumbers, and other truck and canning crops are successfully grown, with good yields. Fruit also does well, particularly plums and pears.

The Miami gravelly loam is well suited to a wide variety of crops, occupying as it does an intermediate position in regard to texture, and capable of maintaining a good moisture supply, with free circulation. It maintains a good growth of grass and small grains, with the exception of timothy, and is finely suited to heavy truck, small fruit, and tobacco, but is best suited to the latter. The more gravelly and sandy areas are best suited to that important crop. It produces good yields of a medium-weight filler leaf of good quality, and is considered a very desirable soil.

More attention could profitably be given to the growing of truck crops and small fruits, and a less acreage devoted to general farming. The average yield of potatoes could be much increased by closer attention to proper fitting of the ground and thorough cultivation.

The following table gives mechanical analyses of typical samples of fine earth of the soil and subsoil of this type:

Mechanical analyses of Miami gravelly loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9207	1½ miles W. of Baldwinsville.	Brown sandy loam, 0 to 9 inches.	2.20	1.12	3.52	5.44	21.66	23.02	31.32	13.70
9209	1 mile E. of Woodard	Brown loam, 0 to 9 inches.	2.84	2.38	8.50	12.38	19.74	13.84	22.46	20.72
9205	¼ mile NW. of East Onondaga.	Loam to sandy loam, 0 to 8 inches.	3.77	5.00	9.96	5.50	9.50	11.78	32.80	25.46
9208	Subsoil of 9207.....	Yellow sandy loam, 9 to 30 inches.	.41	.52	3.40	5.36	24.62	21.80	32.20	11.70
9206	Subsoil of 9205.....	Silty and sandy loam, 8 to 20 inches.	1.88	4.50	10.32	6.20	9.28	12.52	38.46	18.72
9210	Subsoil of 9209.....	Brown sandy loam, 9 to 26 inches.	2.34	1.86	9.30	11.38	19.54	13.84	22.50	21.40

MIAMI STONY LOAM.

The soil of Miami stony loam is a brown or reddish-brown loam, usually silty, but occasionally sandy in small areas. The depth varies from 7 to 14 inches, with an average of 10 inches. From 5 to 30 per cent of stone and gravel, consisting mainly of rounded red sandstone and angular limestone fragments, with a few erratic boulders of granite and gneiss, is present on the surface and throughout the soil and subsoil.

The subsoil from 10 to 36 inches is a red or brownish-yellow clay loam or clay, usually silty, and resting on limestone, shale, or consolidated gravel at from a few inches to depths slightly greater than 3 feet. A relatively small part of the type is underlain by the shale or gravel.

Wherever bed rock approaches close to the surface the overlying subsoil is heavy, and sometimes partially derived from the limestone or shale. In no part of the type does the glacial material attain any great depth. The soil is usually deeper and more free from stones at the foot of slopes and in the narrow valleys.

The Miami stony loam occupies the high, rolling hills and tablelands which comprise most of the southwestern half of the area surveyed, and is quite uniform over large areas, varying only in sand and stone content. In extent it is one of the most important types of the section.

It exhibits highly characteristic features of a glaciated area; the long, rounded hills, with smooth contours lying with their longer axes in a parallel direction, showing the course of the ice sheet in its southward progress. This type occupies the highest positions in the area, and ranges in elevation from below 400 feet to a little over 1,100 feet above tide level on a few of the highest hills, which are too steep for cultivation.

The streams draining this soil are short and rapid, carrying little water in dry weather, but swelling rapidly after heavy rains, when they transport considerable alluvium to the lower valleys.

The elevation and inclination of areas of this soil favor drainage, which is adequate over most of the type. The subsoil is capable of maintaining sufficient moisture for the need of any crop grown in the region, except on the steeper slopes, which are subject to drought in some seasons.

The Miami stony loam is derived from a thin layer of glacial material deposited over limestone and shale and has been but little modified, except through the natural agencies of weathering in place, since it was deposited. It is probable that the subsoil has been in part derived from the bed rock, but most of the type is purely glacial in origin. Occasional large boulders are scattered on the surface, and the smaller rocks are distributed in varying proportion, with no evidence of even partial stratification or reworking by the agency of water. The surface soil is well weathered and fairly mellow.

It is in the production of general farm crops that this type excels the other soils of the area, and most of it is utilized, under fairly intensive methods, for general farming purposes. The principal crops are grass, alfalfa, corn, oats, potatoes, and wheat. The yields of clover and timothy hay range from $1\frac{1}{2}$ to 3 tons per acre. Three tons of alfalfa is an average yield for three cuttings, and this crop is an important one in this section, covering a large area. The steeper slopes are used for grazing, and furnish good pasture for large herds of Holstein cattle, whose milk is shipped to the Syracuse and New York markets. Corn produces from 50 to 100 bushels per acre of grain in the ear, and the stover is preserved in silos, which abound in this part of the State. Oats yield from 40 to 80 bushels per acre, depending on the season, and are of good quality and weight. Potatoes yield from 50 to 200 bushels per acre, but the average yield is rather low, and the type is not especially suited to the crop, except in

the small valleys where the soil is deep and loamy. Wheat does well and yields as high as 25 bushels per acre with ordinary fertilization.

The Miami stony loam is best suited to the small grains, grasses, corn, fruits, and grazing, and this adaptation has been well recognized in this area. It is finely suited to apples, but few large orchards are seen, the industry being largely confined to small orchards, which are found on nearly every farm. The comparatively high elevation of most of the type seems to favor the production of finely colored fruit. Those portions too steep for cultivation are well adapted to grazing, but are inclined to suffer from prolonged drought. This type of soil is recognized as a somewhat heavier type than the Miami stony loam mapped in the Lyons area, New York.

The texture of fine earth of the Miami stony loam is shown in the following table of mechanical analyses:

Mechanical analyses of Miami stony loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.06 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9213	3 miles E. of Syracuse.	Dark-brown loam, 0 to 8 inches.	3.39	1.04	3.06	3.76	15.36	21.08	32.42	22.50
9211	1 mile E. of Camillus.	Brown silty loam, 0 to 14 inches.	4.08	1.32	2.50	1.52	3.12	5.10	57.26	28.68
9212	Subsoil of 9211.....	Heavy silty loam, 14 to 36 inches.	2.05	.94	3.20	1.90	3.10	5.12	58.84	27.00
9214	Subsoil of 9213.....	Loam to clay loam, 8 to 36 inches.	1.44	1.48	3.74	3.28	10.40	13.10	35.60	32.14

WARNERS LOAM.

The soil of the Warners loam, which is derived from marl, to a depth of 10 inches consists of a mellow brown loam containing many calcareous nodules and a considerable proportion of marl. The subsoil is a gray or white marl, silty in character and of soft, unctuous feel, containing thin beds of muck at various depths.

Most of the marl is covered with other materials, and the only outcrop mapped is a small area southwest of Warners, where the soil is derived directly by weathering from the underlying marl beds. Extensive deposits underlie the soils of the level valley, extending across the area from Jordan to East Syracuse, and are used in the manufacture of cement. It is doubtful if they would prove of much

value as an agricultural fertilizer, except to furnish lime. They are not much richer in potash than an ordinary soil.

Good crops of corn and grass were observed on this type.

MUCK.

The low-lying, poorly drained areas where accumulations of partially decayed vegetable matter have reached a depth of more than 12 inches have been classed as Muck. The soil consists of a heavy black loam, rich in organic matter, more or less sandy, and filled with roots and humus, having a depth of 12 inches or more, and underlain by a subsoil of the same nature, usually lighter in color, or by a stratum of light-colored, sticky, fine sand or by a mottled clay similar to the subsoil of the Alloway clay where it joins that type. In several of the larger valleys it is underlain at varying depths by a white, calcareous marl holding thin beds and bands of muck.

The larger areas are found bordering the Cicero Swamp and in the level valley between Jordan and East Syracuse. Smaller areas occur in depressions and along small drainage systems throughout the area.

While this soil occurs at all elevations, it is lower than the types immediately surrounding it, usually occupying level or cup-shaped depressions, with little change of elevation in any one area.

Almost complete lack of natural drainage is responsible for the formation of this type, and it is consequently a wet, sour soil, in need of thorough artificial drainage to make it of agricultural value. When properly drained it makes a very valuable soil for special crops.

This type owes its origin to the accumulation and partial decay of the rank growths of vegetable matter common in swampy areas, and is for the most part of quite recent formation, some of the type having barely emerged from the condition of actual swamp. On first being tilled it is jet black in color, but on continued cultivation it becomes brown from more complete decay of the humus.

Corn, onions, celery, and potatoes are the chief products, and heavy yields are secured in favorable seasons. Corn yields as high as 100 bushels per acre, and onions average 400 bushels, with occasional yields as high as 600 bushels or even more. Potatoes make good growth, but are said not to keep well, and are not so salable for that reason.

Sugar beets succeed well on this type and yield from 10 to 18 tons per acre. As a rule the sugar content is not as high as in those grown on the Miami loam and some of the other drier types, but no trouble is experienced in producing beets of the sugar content required by the factory. Owing to scarcity of labor the acreage grown has recently declined considerably. Many sugar beets are grown for stock feed, for which purpose they are very desirable, especially in milk production.

The Muck is best suited to onions, cabbage, and celery, and this natural adaptation has been well recognized here. These industries are worthy of more attention, and will doubtless steadily develop.

SWAMP.

Owing to the level features of the northern part of the Syracuse sheet—a part of the Ontario Plain known as the “Great Levels”—and to the comparatively recent and imperfectly established drainage there, many considerable areas of Swamp occur, the largest of which is known as the Cicero Swamp. They are filled with standing water and support a dense growth of tamarack and balsam trees and water-loving shrubs and grasses. Where cleared along the borders a rich black mucky soil is found, which is of considerable value as a celery and onion soil, and also produces fine crops of corn in dry seasons.

Although the larger swamp heads a distance of but 2 miles from Oneida Lake, and has an elevation of 25 feet above that body of water, yet the partial drainage which now exists leads in a westerly direction, and then turns north, emptying into the Seneca River. The fall in either direction is ample to effectually drain this large area, whether by the present channel or by a channel cut through to Oneida Lake. Some effort has been made toward draining the smaller swamp by deepening the existing outlet, and much valuable Muck land has been reclaimed to cultivation, but the larger swamp, containing a number of square miles of surface, and a large part of the smaller swamp still remain unreclaimed.

It would seem, at the present value of such lands, that the time is at hand to seek the aid of the State in the drainage of these areas of Swamp, as has been profitably done elsewhere, thus removing an unhealthy and unsightly condition, and reclaiming large areas of valuable lands in the midst of this thickly settled community.

Several smaller areas scattered through this section could be easily and permanently drained by a little concerted effort on the part of the property owners.

MADELAND.

The areas shown on the map as Madeland do not fit into any of the other soil types. They are the result of mining or, in some areas, dredging operations, and, while having no present agricultural value, cover considerable tracts, and for that reason were shown on the soil map. No analyses of the materials forming these areas were made.

AGRICULTURAL METHODS.

The practice of agriculture in the Syracuse area is fairly intensive, although in this respect it does not approach those sections where trucking and market gardening form the largest crop interests.

The manner of preparing the ground is the same as that common throughout the North and East. The latest improved implements are in general use, and each farm is supplied with a full complement of the various tools necessary to full and proper preparation of the seed bed and cultivation of the crops grown.

Some form of rotation is used on all farms. Corn and oats or wheat and grass is the usual order on the lands devoted to general farming and stock raising, while potatoes, tobacco, truck, barley, and various green feed crops enter into the system on the various soils to which they are suited. Stable manures are used almost exclusively as fertilizers, and are used in rotation on different fields with the object of covering the entire farm in the course of from four to six years. Where tobacco enters into the crop rotation the fertilizer is directly used on that crop, relying on the surplus to produce the succeeding crops. Tobacco is rarely grown more than two successive seasons on the same field.

The corn fodder is nearly all preserved as silage, and nearly every dairy farm has a silo of improved form. Pea vines, as they leave the canning factory, are often utilized in this way. Large areas of Alloy clay are given over to the production of hay, which is baled and hauled to the nearest shipping point or to the Syracuse market.

Truck finds a ready sale at the local market, or is shipped to New York. Large canning factories form an outlet for a large amount of produce grown on the light soils of the flats. Alfalfa is an extensive crop, particularly on the Miami stony loam. It usually makes a full stand the second season, and three cuttings are made, averaging a ton or more per acre each cutting: The total yield reaches 3 to 4 tons per acre in a single season. It is in high favor as a feed for dairy cattle and assists materially in maintaining the productiveness of the soil.

The Muck areas are much used for corn, onions, and celery, and where too wet for cultivation are used for grazing. Much of the sugar-beet industry of this section is located on the Muck along Onondaga Lake. It produces a rather heavy yield of beets of fair sugar content, the yields varying from 10 to 18 tons per acre. They bring \$5 per ton on board cars at Syracuse, and must analyze 12 per cent or more in sugar content, no premium being paid for beets analyzing higher. Beets also do well on many of the lowland soils, where the tap root can readily penetrate to a sufficient depth. The large amount of labor necessary to the successful cultivation of this crop and the rather low profit per acre prevents any large increase in the acreage of this important crop, although climatic conditions and soils alike are favorable to its extension. Shipping facilities and the abundance of limestone of good quality all mark this as a favored locality for the extension of the industry.

Tobacco is the most important special crop on several foreland soil types occurring in the northern part of the county, particularly on the Miami gravelly loam, the Miami silt loam, and the Miami fine sandy loam, and the Miami fine sand. The annual crop amounts to about three-quarters of a million dollars in Onondaga County, and is nearly all produced on the types mentioned.

The quality of the leaf grown varies considerably on the different types, the heavier soils producing filler leaf entirely, while the lighter types, particularly the Miami fine sand, produce a fair proportion of leaf suitable for wrapper purposes.

The seed used is home grown, known as the "Wilson," introduced by a local grower of that name in 1881. Previous to that time the Connecticut broadleaf had been grown. The demand for a dark leaf was responsible for the change. The Wilson has more body and gives a darker color when cured. The demand has since changed to a lighter leaf, but the growers are still producing the Wilson type.

Plants are started in seed beds, usually in garden plots, and set in rows 3 to 3½ feet apart in the row. Transplanters are used almost exclusively, and the rapidity with which a good, even setting is accomplished with their use results in too large an acreage for best results. Some commercial fertilizers are used, but stable manures are more largely and generally in use on this crop. The quantity used per acre is inadequate for the best results. Planting occurs between June 15 and July 15. The last plantings are too late to mature properly, do not color well, and injure the sale of the balance of the crop. Owing to shortness of the season much might be gained by starting plants under glass. The crop is usually cut from August 15 to August 30, or sixty days after planting. Cutting sometimes continues as late as September 15. The curing barns as a rule are not well fitted, and there is much room for improvement in this particular. The crop has been bought in the bundle and sorted at the warehouse, but recently most growers have been packing their own crop and selling in case. Methods of handling are much the same as in the Connecticut Valley, though not so thorough. The heavy soils around Plainville produce large yields of heavy filler leaf, averaging 7 cents per pound. That grown on the lighter sandy soils varies in price from 8 or 9 cents to 10 or 12 cents for the best, 10 cents being a good average price. One thousand to 1,200 pounds is the average yield, much depending on the season and consequent length of leaf.

It would seem that this industry could be brought up to the standard of the Connecticut Valley by the introduction of new seed, the use of commercial fertilizers, and better methods of culture and handling.

AGRICULTURAL CONDITIONS.

The farm buildings in the Syracuse area consist of commodious frame, brick, or stone dwellings of two stories, stables for stock,

large barns for storing the crops, tool sheds, and granaries. In the dairying sections silos are an additional feature, and tobacco barns are added to the equipment where that crop is grown. Farms, as a rule, are well fenced with improved wire fencing, the old stump, stone, and rail fences having mostly disappeared.

Most of the farms are worked by the owner and his family. Tenants on rented farms pay either a cash rent or a share of the crops. Much of the tobacco crop is raised under a peculiar tenant system—the owner furnishes fertilizer, and the tenant cultivates, packs, and markets the crop for one-half or two-thirds its value. The potato crop is often included in this arrangement, and the owner pays the tenant by the day for any other labor performed on the farm.

But few large land holdings remain in this section. A few corporations and firms hold large tracts near the city, which are well farmed under the supervision of competent overseers, but the average size of farms is not over 75 acres, ranging from 20 to several hundred. The comparatively small size of farms in large measure accounts for the prosperity of the farming class in this region.

Labor is scarce, but generally efficient, more especially where directly engaged in the production of the money crops, as noted above. Foreign laborers, particularly women and children, are employed in the care of the sugar-beet fields near Syracuse, and in fact this crop could scarcely be profitably grown if adult labor at present wages were employed.

The character of crops grown differs widely in the area, but closely follows the physiographic and textural features. The rolling hills and plateau lands are largely devoted to general farming, dairying, and apple orcharding. It was here that the Primate apple was originated. The flat lands are the home of the truck, tobacco, and small-fruit industries of the section, while the heavy clays of the forelands are used almost exclusively for hay. Osier willows for basket making are an important crop on many lowland soils unsuited to other crops. Wheat was formerly an important crop on the highland soils, but has been replaced by corn, oats, and alfalfa since the opening of the great western wheat belt. Many large Holstein herds are now maintained, the milk being shipped to Syracuse and New York City.

Market gardening receives considerable attention near Syracuse, and canning crops are extensively grown, the principal ones being pease, tomatoes, beans, and sweet corn. The growing of cucumbers for pickling is a recently developed industry on the trucking soils and has proven profitable and well adapted to this section. Of the small fruits, plums, pears, and cherries receive the most attention, and are successfully grown on most of the foreland-soil types.

The adaptation of soils to special crops is thoroughly recognized and practiced in this area, and future improvements in agriculture here

will necessarily consist principally in betterment of methods of cultivation and handling rather than in any radical changes in the character of crops grown.

The Syracuse area is well supplied with all forms of transportation, being traversed from east to west by the main line of the New York Central Railroad, the West Shore Railroad, and the Erie Canal; and from north to south by the Delaware, Lackawanna, and Western Railroad, the Rome, Watertown, and Ogdensburg and Auburn branches of the New York Central, and the Oswego Canal and Seneca and Oneida rivers, which are navigable throughout the area. Numerous electric lines connect the smaller towns with Syracuse, and others are projected and in course of construction.

With the New York markets accessible by cheap canal transportation for bulky products, and but a few hours distant by many lines of railroad, where milk and the more perishable products are to be shipped, this area is favorably situated for the advantageous disposal of its diversified agricultural products. Roads are numerous and well kept, many being surfaced with crushed stone. A few plank roads are maintained as toll roads by private corporations. All parts of the area are easy of access and in quick communication with each other and the outside world.

Syracuse is a busy manufacturing town with a large laboring population to support, and furnishes an excellent market for a large section of surrounding country. New York, Boston, and Philadelphia are quickly reached by rail and furnish an outlet for a greater part of the farm produce of this section.

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