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UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey

of

Monroe County, New York

By

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United States Department of Agriculture

and

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Cornell University Agricultural Experiment Station

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By A. T. SWEET, in Charge, and W. J. LATIMER, United States Department of Agriculture, and C. S. PEARSON, C. H. DIEBOLD, W. W. RIETZ, C. P. MEAD, WILBER SECOR, and MONTAGUE HOWARD, JR., Cornell University Agricultural Experiment Station

COUNTY SURVEYED

Monroe County lies along the shore of Lake Ontario in the western part of the State of New York (fig. 1). Rochester, near the center of the county, is 70 miles east of Buffalo and 330 miles northwest of New York City.

The county extends southward from the lake shore a distance of about 25 miles and has a maximum width of 32 miles. Its total area is 656 square miles, or 419,840 acres.

Topographically, the northern part of the county consists of a nearly level lake plain along Lake Ontario, south of this is a more uneven and undulating belt of land, and in the southern and southeastern parts is a well-developed hilly area.

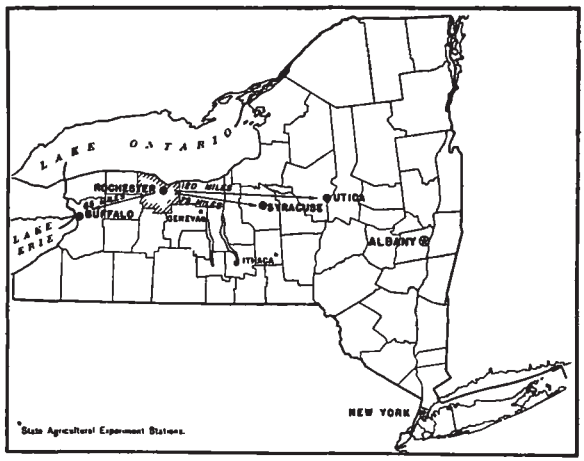

FIGURE 1.—Sketch map showing location of Monroe County, N. Y.

The lake plain, west of Genesee River, ranges in width from about 4½ miles near the river to about 8 miles from Braddock Point westward. Its southern limit is the old beach line, or "ridge", from which it slopes gently toward the lake, terminating in a sandy and gravelly beach or, in places, in a low bluff. The surface of the plain, as a whole, is more nearly level than that of the rest of the county. There is a gentle slope toward the lake of about 25 feet to the mile. The plain is crossed by a number of small streams which occupy broad shallow valleys, all flowing in a general northeasterly direction and emptying into Lake Ontario. Within the plain are numerous low ridges and small circular or elliptical hills ranging from 5 to 50 or more feet above the general level of the plain. The lake shore is bordered by a low ridge of beach sand and gravel, back of which in many places are ponds and small areas of marsh. Lake Ontario lies at an elevation of 246 feet above sea level, and the elevation of the lake plain immediately north of the ridge is approximately 400 feet, giving a fall of about 150 feet between the ridge and lake.

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East of Genesee River, the width of the lake plain ranges from slightly more than 2 to nearly 5 miles, and, as a whole, the plain lies at a slightly greater elevation above the lake than that part west of the river, and in places it is much more deeply dissected.

The southern part of this section of the lake plain is nearly smooth, but the northern part is deeply dissected by several small streams which empty into Lake Ontario. In the section directly north of Rochester, occupied in part by Durand-Eastman Park, dissection by streams has advanced until only narrow strips and isolated areas of the old plain remain, and nearly the entire section consists of steep hill slopes and narrow valleys. In other places along the lake front the plain terminates in nearly perpendicular bluffs ranging from 40 to 75 or more feet in height.

Irondequoit Bay and the narrow valley of Genesee River are bordered by very steep slopes rising to a height of 100 feet or more. On the east side of the river, north of Seneca Park, is an old high semicircular valley of the river, which is also bordered by a steep slope but not so high as that bordering the river valley to the south.

The ridge is an old beach line of Lake Iroquois, a glacial lake, which formerly occupied the Ontario Basin. It ranges in width from only a few to several rods and has an elevation ranging from 10 to 40 feet above the lake plain on the north. In most places it is slightly higher than the land immediately south of it but in some places lies at about the same level.

South of the ridge is a broad belt of undulating and low hilly country having a maximum elevation of about 600 feet above sea level. This belt ranges in width from about 4 miles in the eastern part of the county to more than three times this width in the western part. Within this belt are some small comparatively smooth nearly level areas, but much of the land consists of low hills and elongated ridges or drumlins, ranging from 40 to nearly 100 feet above the general level of this section of the county and having a prevailing northeast or north-northeast trend. Some of the drainage from this belt flows through the ridge and directly into Lake Ontario, but the greater part reaches the lake through Genesee River or through Irondequoit Bay.

South of this belt is an area covering the southern and southeastern parts of the county, in which the drumlins are higher and more numerous, covering almost the entire area. The maximum elevation in this section, particularly in the southeastern part of the county, is approximately 900 feet above sea level. Small hills with sharp steep slopes and intervening small kettlelike valleys occur in places in this more hilly section. This kame relief is well developed in the vicinity of Mendon Ponds but occurs to some extent in other places.

Genesee River crosses the county from south to north, meandering through a nearly level valley from 1 to 2 miles wide to a point near the center of Rochester, where it passes over a series of falls, and from which point it flows through a deeply eroded gorge to the lake. Oatka Creek, which drains the southwestern part of the county, Honeoye Creek, which drains the southeastern part, and some smaller streams flow into Genesee River. Irondequoit Bay, an old preglacial outlet of Genesee River, forms a deep shore indentation and offers excellent possibilities for the development of a deep lake harbor.

Irondequoit Creek flows into it, draining much of the eastern part of the county.

This entire area was, at the time of its settlement by white people, heavily forested, the tree growth consisting largely of maples, oaks, beech, ash, elm, hickory, and hemlock. Numerous other trees, shrubs, and vines were abundant. All the land was cleared many years ago. A few small wooded areas, principally of second-growth trees, remain in wood lots, parks, and some poorly drained situations.

The first permanent settlement in the territory which afterward became a part of Monroe County was made in 1790. Permanent settlement at Penfield began in 1801. In 1811 lots were surveyed and sold in Rochester, but little movement or accession of population and business took place until 1815 or 1816.[1]

Development of Rochester as a city is owing in large part to its geographic position. The falls of Genesee River at this point afforded abundant water power which was first used for grinding corn and wheat and later for numerous large manufacturing industries. This city is also located along the easiest route from the Hudson Valley to the West, by way of the Mohawk Valley and the outlet into this valley from old Lake Iroquois. This route was followed by the Indians, by the early pioneers, and by the Erie Canal which was later enlarged into the Barge Canal. The harbor at the mouth of Genesee River has also been a factor in stimulating trade.

In 1817 a few settlements were begun along the Lyell road and also along the Buffalo road in the section later included in the town of Gates. Monroe County was organized in 1821, and the population the preceding year was 26,855. The Erie Canal, which greatly stimulated settlement of this section, was opened in 1825. The population of Monroe County in 1930 was 423,881, of which 328,132 were residents of the city of Rochester. Only 14.8 percent of the population is rural.

Rochester is an important manufacturing and commercial city, well supplied with transportation facilities. Both the city of Rochester and Monroe County have excellent systems of streets, highways, and public parks. The rural roads are good and plainly marked at each intersection. Brockport, Spencerport, Churchville, Mumford, Honeoye Falls, Fairport, Webster, and Hilton are smaller towns and trading points.

The county is well supplied with railroad facilities, the New York Central, Lehigh Valley, and Pennsylvania lines giving connections with all parts. The Barge Canal passes through the county affording transportation from the Great Lakes to tidewater. There is also considerable lake traffic.

CLIMATE

The climate is well suited to fruit growing, dairying, and the widely diversified types of agriculture carried on.

The mean annual temperature at Rochester, which is 523 feet above sea level and 277 feet above the level of Lake Ontario, is 47.6° F. The highest recorded temperature is 101°, and the lowest is —22°.

The mean annual precipitation is 32.83 inches and is rather uniformly distributed through the seasons, the precipitation for the fall

[1] TURNER, O. HISTORY OF THE PIONEER SETTLEMENT OF PHELPS' AND GORHAN'S PURCHASE. 624 pp. Rochester. 1851. See pp. 415, 576.

being only slightly less than that for each of the other seasons. The average annual snowfall is heavy. The average date of the latest killing frost, as recorded at the United States Weather Bureau station at Rochester, is April 26 and of the earliest is October 20, giving an average frost-free season of 177 days. Frost has been recorded at this station as late as May 27 and as early as September 14.

The importance of the lake-shore section for the growing of tree fruits, the most important industry of this part of the county, is owing largely to climatic conditions. Near the lake the tempering influence of this large body of water affords protection from the low temperatures reached on the higher lands only a few miles from the shore. The equalizing influence of the lake also prevents early blooming and injury from late spring frosts. Apples are rarely seriously injured by low winter temperatures or by late spring frosts, and peaches, cherries, and plums are grown with a considerable degree of success. Injury occurs occasionally in the lake district from cold cloudy weather in the spring at blossoming time, preventing proper pollination by bees and other pollen-distributing insects.

The precipitation is sufficient, owing to low evaporation, for all the crops grown, and where the land is flat and the soils poorly drained, moisture and ground water are in places excessive. Injury both to tree fruits and to other crops results at times from lack of moisture, owing in part to compact subsoils which prevent its conservation.

The normal monthly, seasonal, and annual temperature and precipitation, as recorded at Rochester, are given in table 1.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Rochester, Monroe County, N. Y.*

[Elevation, 523 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1834)	Total amount for the wettest year (1873)	Snow, average depth
	°F.	°F	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	29.3	70	−10	2.72	0.53	4.60	16.2
January	24.6	71	−14	2.89	.11	3.33	19.2
February	24.6	70	−22	2.69	.73	1.52	20.0
Winter	26.2	71	−22	8.30	1.37	9.45	55.4
March	31.8	86	−7	2.76	.78	7.02	13.6
April	44.9	90	7	2.35	1.60	4.71	4.8
May	57.1	93	27	2.94	.91	3.52	.3
Spring	44.6	93	−7	8.05	3.29	15.25	18.7
June	66.1	95	36	3.00	1.61	1.86	0
July	70.7	101	45	2.96	1.45	5.44	0
August	69.2	98	43	2.88	1.38	3.01	0
Summer	68.7	101	36	8.84	4.44	10.31	0
September	62.4	98	34	2.45	1.89	2.97	0
October	51.5	89	19	2.65	4.06	8.67	.4
November	38.7	75	1	2.54	1.99	3.24	7.0
Fall	50.9	98	1	7.64	7.94	14.88	7.4
Year	47.6	101	−22	32.83	17.04	49.89	81.5

AGRICULTURE

The agriculture in this county is extremely diversified, owing to climatic conditions, soils, transportation facilities, and market requirements.

The county occupies a large part of one of the most important apple-growing districts in the United States, which extends along the south shore of Lake Ontario and which is the result, in large part, as already noted, of favorable climatic conditions, although the soils, also, are moderately favorable and have made apple growing possible. Apple growing was begun by the early settlers and has continued to be important. A number of high-producing orchards are 50 or more years old, and a few producing apple trees in this county are nearly 100 years old (pl. 1, *A*). Many of the older orchards, however, were seriously injured by the extremely cold winter of 1933–34. The most important apple-growing section is a belt along the northern part of the county covering parts of the lake plain, but a considerable acreage in other parts is devoted to apple growing.

Other tree fruits include peaches, cherries, pears, plums, prunes, and quinces. The importance of fruit growing in Monroe County is shown by the figures reported in the 1930 census of the yields in 1929, as follows: Apples, 604,359 trees with a yield of 1,245,009 bushels; peaches, 137,289 trees, 116,691 bushels; pears, 164,189 trees, 71,791 bushels; plums and prunes, 24,588 trees, 14,465 bushels; cherries, 70,742 trees, 71,480 bushels; and quinces, 3,958 trees, 3,261 bushels. Since 1929, fruit production has decreased to some extent, owing to adverse economic conditions, low prices of the fruit, and to the serious injury to the orchards from extreme low temperatures during the winter of 1933–34. Many orchards have been neglected, some have been abandoned and the trees cut down, and very few young trees have been planted.

General farming and dairying are carried on to some extent in all sections, but they predominate south of the ridge, especially where the soils are productive and suited for growing clover and alfalfa. On many farms, general farming includes the growing of potatoes, cabbage, tomatoes, and beans for sale, the extent of production of these crops depending on the suitability of soil, accessibility of markets, and market demands.

The acreage and relative importance of the different farm crops are shown by data from the Federal census report giving the acreage and yield of the more important crops grown in 1929. Tame grasses were grown on 51,363 acres with a yield of 75,046 tons. This included timothy or timothy and clover mixed on 36,132 acres, 47,779 tons; alfalfa on 9,576 acres, 18,695 tons; clover alone on 4,851 acres, 7,820 tons; and other tame grasses on 370 acres, 752 tons. Wheat was grown on 29,744 acres, with a yield of 488,989 bushels; oats on 19,431 acres, 408,287 bushels; barley on 2,914 acres, 57,949 bushels; potatoes on 8,886 acres, 1,103,750 bushels; dry beans on 8,226 acres, 119,256 bushels; corn for silage on 7,926 acres, 58,098 tons; corn for grain on 5,465 acres, 224,807 bushels; and buckwheat on 1,033 acres, 17,474 bushels. In 1934, 57,687 acres were devoted to hay and forage crops.

On January 1, 1935, there were in the county 9,930 horses, 121 mules, 26,656 cattle, 11,905 sheep, and 7,603 swine.

The more important vegetables grown for market are potatoes, cabbage, tomatoes, and sweet corn, but many others are grown to some extent. In 1929, 13,250 acres were devoted to vegetables, exclusive of potatoes, and the total value of these crops was $1,648,587. The acreage and value of the more important vegetable crops in 1929 are given in detail as follows: Cabbages, 4,067 acres, value $448,079; tomatoes, 2,514 acres, $352,029; sweet corn, 2,244 acres, $143,521; green peas, 934 acres, $32,581; mixed vegetables, 874 acres, $204,137; cucumbers, 585 acres, $53,933; snap beans, 546 acres, $60,751; celery, 324 acres, $103,166; carrots, 239 acres, $52,092; cantaloups, 181 acres, $40,129; asparagus, 132 acres, $36,901; spinach, 131 acres, $19,266; lettuce, 86 acres, $20,140; and dry onions, 31 acres, $18,374. Vegetables on smaller acreages include lima beans (green), beets, broccoli, cauliflower, eggplant, onions (green), parsnips, peppers, pumpkins, radishes, rhubarb, turnips, watermelons, and a few others. The small fruits include grapes, raspberries, Logan and other blackberries, strawberries, dewberries, and currants.

The type of farming in which these crops are grown, especially the small fruits, is confined, for the most part, to small areas near Rochester or to some of the numerous villages. A rather large district immediately north of Rochester is used almost exclusively for truck gardens and greenhouses, and areas in the towns of Greece and Gates, west of Rochester, are used in the same way. Many large greenhouses are in Monroe County, the greatest number in the vicinity of Rochester. In some of these, tomatoes, radishes, lettuce, and cucumbers are grown during certain seasons and flowers during other seasons. Other greenhouses are devoted entirely to growing flowers. Nursery stock, including both fruit trees and ornamental trees and shrubs, is grown extensively. A large acreage is devoted to flowers grown in open fields.

Poultry raising is a rather important agricultural pursuit. The number of chickens on farms on April 1, 1930, was 318,146, and they were valued at $362,686. The census reports 596 turkeys, 9,638 ducks, 5,375 geese, and 553,709 chickens raised in 1929 with a total value of $667,477. Eggs produced amounted to 2,267,899 dozens, valued at $839,123. A few bees are kept, partly for the purpose of distributing the pollen of fruit trees.

According to the United States census of agriculture for 1935, Monroe County had a larger acreage and production of wheat in 1934 than any other county in New York. The acreage in wheat totaled 27,808 acres in 1934 as compared with 29,744 acres in 1929. Monroe is now the second leading rye-producing county in the State, having 1,936 acres devoted to this crop in 1934. Land from which crops were harvested totaled almost 16,000 acres more in 1934 than in 1929. Most of this gain was due to increases of approximately 6,000 acres of hay, 2,000 acres of corn, 3,000 acres of oats threshed, and 3,500 acres of potatoes. With 12,321 acres in potatoes in 1934, this county now ranks among the leading 10 potato-producing counties in the State.

The number of cattle in 1935 was 26,656, an increase of 13 percent over the number in 1930. Most of this increase resulted from an

increase in cows, from 15,331 to 18,240. With 7,603 hogs on January 1, 1935, Monroe County ranks second in the State in the number of hogs.

An expansion in agriculture is indicated by an increase (between 1930 and 1935) of 22 percent in the number of farms and 8 percent in the amount of land in farms. During the same period there was a decline, however, in the average value of land and buildings per farm, from $12,625 to $7,399. Nearly 80 percent of the county is in farms, and the average size of farms is 66.3 acres, of which slightly more than 80 percent is in cropland and plowable pasture. Of the 5,084 farms reported by the census in 1935, 77.8 percent were operated by owners and part owners, 20.8 percent by tenants, and 1.4 percent by managers.

The use of fertilizer is general. The total amount spent for fertilizer in 1929 was $474,440, an average of $149.66 for each of the 3,170 farms reporting its use.

SOILS AND CROPS[3]

The soils of Monroe County may be divided into groups based on the study of soil profiles, as observed in excavations made for that purpose, in roadside cuts, in gravel pits, and in stream and gully banks; the surface relief; the appearance of the crops; and the native vegetation. Within each group are variations caused partly by drainage conditions. A description of the soils of the different groups follows.

Group 1 includes brown and dull reddish-brown soils with very gravelly subsoils, the gravel consisting largely of irregular fragments of dull-red sandstone, not stratified or deposited in layers, or of glacial till material. Till of this kind covers almost the entire county and ranges in depth from only a few feet in some places to many feet in others. On the greater part of the lake plain it is comparatively shallow, but south of the ridge it is deeper. In the southeastern part of the county it is, in places, 200 feet thick, and in the old abandoned valley of Genesee River near Rochester well borings show it to be much thicker. In some places north of the ridge the till shows evidence of having been modified by water action, as indicated by zones of stratification, in which are thin layers of rounded gravel and sand. Soils of this group occupy all the drumlins, many of the smaller hills, and parts of nearly level areas. To this group belong the Ontario, Honeoye, Worth, Clarkson, Hilton, Lyons, and Westbury soils, each of which has some particular distinguishing characteristic.

Group 2 includes brown, light-brown, and reddish-brown soils which are free or nearly free from gravel. The almost gravel-free subsoils consist of thin layers of reddish-brown silt and clay alternating with thin layers of sand or sandy material. To this group belong the Dunkirk, Collamer, Schoharie, Lucas, Fulton, Berrien, Arkport, Ottawa, and Petoskey soils. These soils, as a rule, occupy nearly level upland areas and old high terraces. This group might be further divided into soils of heavy texture, including the soils of

[3] As the soil-survey map of Monroe County was made on a larger scale than maps of the adjacent areas and the soils mapped in much greater detail, the soils do not join in all places along the boundaries.

the first five series, and those of light or sandy texture, including the soils of the last four series.

Group 3 includes brown and grayish-brown, and, in some places, slightly reddish brown soils. These soils also are gravelly, much of the gravel being rounded or water-worn, and the deep subsoil layers consist of water-worn gravel and sand. Soils of this kind occur along the ridge, south of Troutburg, around Mendon Ponds, and in many other places. To this group belong the Alton, Palmyra, and Groton soils.

Group 4 includes soils in which the underlying rock beds are so near the surface that they have an important influence on the character of the soil. This group is comprised of the Brockport, Farmington, Lockport, and Riga soils.

Group 5 includes soils in stream flood plains developed from recently deposited material and subject to frequent or occasional overflow. This group includes the Genesee, Tonawanda, Hamlin, and Eel soils.

Group 6 includes poorly drained soils that are dark gray or nearly black at the surface, developed from mixed and undifferentiated soil material. This group includes the Granby, Colwood, Poygan, Toledo, and Wayland soils.

Group 7 includes the miscellaneous land types—riverwash, rough broken land, muck, marsh, made land, coastal beach, meadow, and unclassified city land.

On the accompanying soil map the large number of soil types and phases have been indicated by different colors and by different rulings. On a soil map the boundary separating two soil types is necessarily indicated by an arbitrary line, but in the field a soil boundary is not a line, or very rarely so, but is a zone of transition, in places several rods in width, through which the characteristics of one soil gradually change to those of another. The bases on which soils are separated differ widely. In places they are pronounced and may be noted on the surface, for example, the difference between sand and clay or between a black soil and a red soil; in other places the separation may be based on depth or condition of the subsoil, with little or no indication at the surface; and in still other places, the separation may be made on the presence or absence of lime in the surface soil or subsoil. In many places two adjacent soils are equally good for some crops but not for others. The difference between an acid and a sweet soil might show but slightly in a field of corn or of oats but very markedly in a field of clover or alfalfa. On a shallow soil, grass or wheat might produce as good yields as on a soil with a deep subsoil, but an apple orchard on such a soil would be much more subject to injury from drought. The natural or inherent characteristics of the two soils, on which their classification is based, may also be so changed by the way in which the individual soil has been managed that they have much the same crop adaptation and may be equally productive. Such changes are brought about by drainage, by fertilization, or by other means.

The numerous separations made on the soil map of this county have been based on conditions found by field examination in the surface soil, the subsoil, or both. The importance of these separa-

tions depends on the farming methods to be used and the crops to be grown.

The grouping given is not based on the general productivity of the soils or on their adaptation for particular crops. On such a basis a grouping may be made approximately as follows:

Class A includes productive or moderately productive soils of good depth, well drained, and free or nearly free from gravel and stones in harmful quantities. These soils are used for all or nearly all crops grown in the county and approximately all are under cultivation. This class includes Palmyra gravelly loam; Palmyra gravelly loam, heavy phase; Genesee silt loam, high phase; Genesee fine sandy loam, high phase; Dunkirk silt loam; Honeoye loam; Ontario loam; Ontario loam, yellow-subsoil phase; Ontario gravelly loam; Ontario silt loam; Ontario fine sandy loam; and Ontario fine sandy loam, yellow-subsoil phase.

Class B includes moderately productive soils. These soils are not so deep, so well drained, so well supplied with lime, or of such good texture as those in class A. Nearly all are under cultivation, and good yields are obtained in many years, but, as a whole, they are slightly less productive and have a somewhat more restricted crop adaptation. Class B soils are Hilton soils of all types; Honeoye loam, shallow phase; Honeoye silt loam, shallow phase; Palmyra gravelly fine sandy loam; rolling phases of Ontario loam and Ontario fine sandy loam; Ontario loamy fine sand; all soils of the Worth series; Berrien fine sandy loam; Dunkirk fine sandy loam; Farmington loam; Farmington gravelly loam; all Clarkson soils; Genesee silt loam; Genesee fine sandy loam; Alton gravelly fine sandy loam; Schoharie silt loam; Schoharie gravelly silt loam; Schoharie fine sandy loam; Collamer silt loam; Collamer silt loam, light-textured phase; Hamlin silt loam; Hamlin fine sandy loam; Brockport silt loam; Brockport gravelly loam; Lockport silty clay loam, brown phase; Arkport very fine sandy loam; Riga silt loam; and Riga silt loam, gravelly phase.

Class C includes soils of moderate or low productivity, which, on account of either very light sandy texture or very heavy clay texture, poor drainage, or shallow subsoil, have a limited crop adaptation and, in general, return low yields. These soils are used largely for small grains, grass and pasture land, and wood lots. Approximately one-half of them is used for tilled crops. Class C soils include Brockport silt loam; Brockport gravelly loam; Lockport silty clay loam; Lockport silty clay loam, brown phase; Westbury loam; Fulton silt loam; Fulton silty clay loam; Lucas silty clay loam; Poygan fine sandy loam; Poygan silt loam; Poygan silty clay loam; Groton gravelly loam; Groton gravelly fine sandy loam; Groton loamy sand; Tonawanda silt loam; Eel silt loam; Eel fine sandy loam; Schoharie clay loam, broken phase; Schoharie silty clay loam; Berrien loamy fine sand; Berrien fine sandy loam, imperfectly drained phase; Ottawa loamy fine sand; Ottawa loamy fine sand, rolling phase; Ottawa loamy fine sand, mottled-subsoil phase; Petoskey loamy fine sand; Petoskey loamy fine sand, rolling phase; Alton loamy sand; Alton coarse sandy loam; Alton coarse sandy loam, light-textured phase; Palmyra gravelly loam, broken phase; Ontario loam, broken phase; Collamer silt loam, poorly drained phase; Collamer silty clay

loam; Farmington cherty loam; Farmington stony loam; Farmington sandy loam; Colwood fine sandy loam; Colwood loam, undrained; Lyons loam; Lyons loam, gravelly phase; Lyons silt loam; Arkport very fine sandy loam; Dunkirk silt loam, broken phase; Wayland silt loam; Wayland fine sandy loam; Wayland silty clay loam; Granby sand; Toledo silt loam; and Toledo silt loam, deep phase.

Class D includes soils of very low natural productivity, resulting from poor drainage, steep broken relief, or some other cause, or having very limited crop adaptation. Class D soils are Petoskey loamy fine sand, steep phase; Petoskey loamy fine sand, dune phase; Ottawa loamy fine sand, broken phase; Arkport very fine sandy loam, broken phase; and muck. Muck has been included with the class D soils because in its natural state it has little crop value. Mucks of certain kinds, however, when drained become highly productive for some crops.

In table 3 the soils are rated according to their productivity for the specified crops grown in the county. In addition, ratings of general productivity are assigned to each soil according to current practices of management and to inherent productivity.

In the following pages the soils are described, and their general agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 2.

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Monroe County, N. Y.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Ontario loam	21,760	5.2	Collamer silt loam, light-textured phase	3,200	0.7
Ontario loam, rolling phase	9,152	2.2	Collamer silt loam, poorly drained phase	1,984	.5
Ontario loam, broken phase	320	.1	Collamer silty clay loam	192	.1
Ontario loam, yellow-subsoil phase	3,008	.7	Lucas silty clay loam	576	.1
Ontario gravelly loam	1,344	.4	Berrien fine sandy loam	15,744	3.7
Ontario silt loam	1,792	.4	Berrien fine sandy loam, imperfectly drained phase	4,736	1.1
Ontario fine sandy loam	28,800	6.9	Berrien loamy fine sand	7,936	1.9
Ontario fine sandy loam, rolling phase	1,216	.3	Schoharie silty clay loam	12,928	3.1
Ontario fine sandy loam, yellow-subsoil phase	2,816	.6	Schoharie silt loam	11,584	2.7
Ontario loamy fine sand	4,608	1.1	Schoharie gravelly silt loam	3,456	.8
Honeoye loam	9,664	2.3	Schoharie clay loam, broken phase	1,216	.3
Honeoye loam, shallow phase	5,440	1.3	Schoharie fine sandy loam	1,024	.2
Honeoye silt loam, shallow phase	192	.1	Fulton silt loam	2,624	.6
Worth loam	1,216	.3	Fulton silty clay loam	384	.1
Worth loam, brown-subsoil phase	64	.1	Arkport very fine sandy loam	1,664	.4
Worth fine sandy loam	192	.1	Arkport very fine sandy loam, broken phase	2,496	.6
Worth gravelly loam, brown phase	192	.1	Ottawa loamy fine sand	6,208	1.4
Worth gravelly fine sandy loam, brown phase	320	.1	Ottawa loamy fine sand, rolling phase	4,992	1.2
Worth stony loam, brown phase	256	.1	Ottawa loamy fine sand, mottled-subsoil phase	1,024	.2
Worth stony fine sandy loam, brown phase	832	.2	Ottawa loamy fine sand, broken phase	128	.1
Clarkson loam	2,304	.5	Petoskey loamy fine sand	5,248	1.3
Clarkson gravelly loam	6,208	1.4	Petoskey loamy fine sand, rolling phase	1,920	.4
Clarkson loam, shallow phase	704	.1	Petoskey loamy fine sand, dune phase	384	.1
Hilton fine sandy loam	6,272	1.5	Petoskey loamy fine sand, steep phase	576	.1
Hilton fine sandy loam, heavy-subsoil phase	4,288	1.0	Alton gravelly fine sandy loam	8,256	2.0
Hilton gravelly loam	20,864	5.0	Alton coarse sandy loam	256	.1
Hilton gravelly loam, heavy-subsoil phase	5,824	1.4	Alton coarse sandy loam, light-textured phase	704	.1
Hilton gravelly loam, shallow phase	3,264	.7			
Dunkirk silt loam	22,336	5.3			
Dunkirk silt loam, broken phase	2,432	.5			
Dunkirk fine sandy loam	1,152	.3			
Collamer silt loam	8,512	2.0			

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Monroe County, N. Y.*—Continued

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Alton loamy sand	128	0.1	Eel fine sandy loam	1,216	0.3
Palmyra gravelly loam	3,712	.9	Westbury loam	512	.1
Palmyra gravelly loam, heavy phase	640	.1	Lyons loam	2,304	.5
			Lyons loam, gravelly phase	1,536	.4
Palmyra gravelly loam, broken phase	256	.1	Lyons silt loam	1,536	.4
			Poygan silty clay loam	3,584	.8
Palmyra gravelly fine sandy loam	4,416	1.0	Poygan silt loam	6,336	1.5
Groton gravelly loam	1,088	.3	Poygan fine sandy loam	2,432	.5
Groton gravelly fine sandy loam	5,440	1.3	Colwood loam	8,960	2.1
Groton loamy sand	448	.1	Colwood fine sandy loam	7,168	1.7
Lockport silty clay loam	8,000	1.9	Granby sand	2,304	.5
Lockport silty clay loam, brown phase	3,776	.9	Toledo silt loam	1,536	.4
			Toledo silt loam, deep phase	2,432	.5
Brockport silt loam	2,688	.6	Wayland silt loam	6,528	1.5
Brockport gravelly loam	1,600	.4	Wayland silty clay loam	832	.2
Farmington loam	2,816	.6	Wayland fine sandy loam	192	.1
Farmington cherty loam	1,408	.4	Muck	5,760	1.3
Farmington stony loam	1,856	.4	Muck, shallow phase	128	.1
Farmington gravelly loam	192	.1	Carlisle muck	1,984	.5
Farmington sandy loam	768	.2	Edwards muck	1,344	.4
Riga silt loam	192	.1	Coastal beach	256	.1
Riga silt loam, gravelly phase	1,024	.2	Meadow	128	.1
Genesee silt loam	3,520	.8	Marsh	3,584	.8
Genesee silt loam, high phase	128	.1	Made land	1,664	.4
Genesee fine sandy loam	768	.2	Rough broken land	64	.1
Genesee fine sandy loam, high phase	384	.1	Riverwash	64	.1
Tonawanda silt loam	5,568	1.3	Gravel pits	64	.1
Hamlin silt loam	3,968	.9	Unclassified city land	16,448	3.9
Hamlin fine sandy loam	320	.1			
Eel silt loam	5,056	1.2	Total	419,840	-----

BROWN AND DULL REDDISH-BROWN SOILS WITH UNASSORTED VERY GRAVELLY SUBSOILS

The soils of this group occupy all the drumlin areas, are the predominant soils in the undulating and hilly section south of the ridge, and comprise a rather large part of the lake plain.

The soils of the Ontario series are the most important and most extensively developed of the group. As originally mapped[8] this series included soils which, on account of rather important differences, have in this survey been separated and given new series names. The more recent separations are the Worth, Hilton, Clarkson, and Honeoye soils.

Soils of the Honeoye series are more alkaline than those of the Ontario series, and they contain lime carbonate at or near the surface. They are brown, dark grayish-brown, or reddish-brown gravelly soils, becoming lighter brown below a depth of 8 inches. The lower part of the subsoil, below a depth of 24 inches, is dark brown or dull reddish brown and very gravelly, the gravel, in most places, being slightly larger, more regular, and including more limestone than that in the Ontario soils.

Soils of the Worth series closely resemble those of the Ontario series in general appearance of the soil profile and in relief. They differ from the Ontario soils in that they are strongly acid throughout the surface soil and subsoil, owing to the character of the glacial till from which they have developed. The Ontario soils have developed from glacial till which contains considerable calcareous shale

[8] CRABB, G. A., CARR, M. E., GILBERT, B. D., and BOUYOUCOS, G. J. SOIL SURVEY OF MONROE COUNTY, NEW YORK. U. S. Dept. Agr., Bur. Soils Field Oper. 1910, Rept. 12: 43–91, illus. 1912.

and sandstone and some limestone, but the till from which the Worth soils have developed contains little or no lime. The compaction of the subsoil also is less pronounced than in the Ontario soils.

Soils of the Hilton series differ from those of the Ontario series in having a more uniform compact layer in the lower part of the subsoil, above which is a layer of gray or mottled gray and rusty-brown material. They occur principally on nearly level, undulating, low ridgy, and hilly areas instead of on well-developed drumlins, and in places they show evidence of water deposition. The compact layer in these soils is more pronounced than in the Ontario soils.

The Hilton soils are characterized by brown or reddish-brown gravelly surface soils; a lighter brown gravelly upper subsoil layer, slightly lighter in texture, faintly or moderately mottled with gray and rusty brown in the lower part, and a compact gravelly till lower subsoil layer which is reached at a depth ranging from 24 to 30 inches. The till consists principally of small irregular fragments of Medina sandstone but includes larger masses of sandstone and some erratics of various origins, embedded in reddish-brown fine sand, silt, and sandy clay. In places the till has been reworked and more or less stratified with layers of water-worn sand and gravel. The surface soil and upper part of the subsoil are slightly acid, but the lower part of the subsoil, below an average depth of 30 inches, is alkaline and effervesces freely with acid. The upper layer of partly weathered till, although very compact, is not cemented. The deeper substratum, below an average depth of about 40 inches, is less compact.

The Hilton soils are most extensively developed in the lake plain midway between the lake and the ridge in the western part of the county, here occupying low ridges and adjacent areas. In the southern part of the county the areas are, for the most part, level. These soils are used for nearly all crops common to this section, and they have been extensively planted to apple orchards. Recent studies [4] have shown that in apple orchards planted on soils of this series the rooting is shallow because the roots cannot penetrate the compact layer of the subsoil. For this reason production is less uniform and for a period of years is lower than in places where trees are planted on soils allowing deeper rooting.

Soils of the Clarkson series differ from the Ontario soils in having a more compact deep subsoil with a moderately developed gray and mottled layer above it, similar to that occurring in the Hilton soils. They differ from the Hilton soils in having a deeper dull-red color and in containing a somewhat higher proportion of dull-red shale and soft shaly sandstone in both surface soil and subsoil.

Ontario loam.—Ontario loam, to a depth of about 8 inches, is brown or slightly dull reddish-brown friable fine-textured loam which, in most places, contains some small irregular sandstone gravel. It is underlain by lighter brown and, in places, yellowish-brown loam of light texture and loose friable consistence, also containing gravel like that in the surface soil, but in places the gravel is more abundant. At a depth ranging, in most places, from 24 to 36 inches

[4] SWEET, A. T. SOIL PROFILE AND ROOT PENETRATION AS INDICATORS OF APPLE PRODUCTION IN THE LAKE SHORE DISTRICT OF WESTERN NEW YORK. U. S. Dept. Agr. Circ. 303, 30 pp., illus. 1933.

below the surface, is a layer of compact very gravelly material consisting largely of small sharp rock fragments, principally sandstone but with some limestone and crystalline rocks of foreign origin, most of which are larger than the sandstone fragments, all embedded in fine rock material. The compact layer ranges from only a few inches to a foot or more in thickness and is underlain by unassorted friable glacial till.

The surface soil and upper part of the subsoil give an acid reaction, but the lower part of the subsoil, usually at a depth of about 30 inches, is alkaline and effervesces freely on the application of acid.

This soil is well suited for general farming, dairying, and livestock raising, and for growing small grains, corn, clover, sweetclover, alfalfa, potatoes, beans, and tomatoes. For growing clover and alfalfa successfully, an application of lime is beneficial or necessary.

This is one of the most extensive and widely distributed soils in the county, also one of the most important from an agricultural point of view. Approximately 95 percent of it is cleared and used for farm crops, and the remainder is in forest. The land is productive and adapted to a wide range of crops.

General farming, combined with dairying, is the leading type of agriculture. Dairying ranges in importance from the practice of keeping a few cows to supply dairy products for home use and a small surplus for sale to that on farms where the entire farming operations center around the dairy.

Another fairly important side line is the growing of fruit. Most farms have orchards, mainly apple orchards ranging in size from 1 acre to 10 or more acres, from many of which fruit is sold in commercial quantities. The planting of fruit trees along the roads is a common practice.

A considerable part of this soil is in grass for hay and pasturage. The grasses are mainly timothy and clover mixed in varying proportions, and clover and timothy are grown separately to less extent. The acreage in alfalfa is increasing. Wheat and oats are the leading grain crops. Plantings of wheat range in size from only a few to 20 or more acres on the individual farm. Wheat is mainly a cash crop, and oats are for the most part a feed crop. Some farmers produce oats for sale. Rye, barley, and buckwheat are minor grain crops. A large part of the bean crop is grown on this soil, and the individual plantings range from 1 to 5 or more acres. Beans are a cash crop. This soil is also used extensively for the production of cabbage and potatoes grown on a commercial scale. The production of small fruits and crops for canning, especially peas and tomatoes, although their acreage is not large, is an important source of income, especially on farms close to markets.

Yields of crops on this soil are somewhat above the average for the county as a whole. Hay yields 1 to 2½ tons; wheat, 15 to 30 bushels, with an average of about 20 bushels; oats, 30 to 65 bushels, averaging about 40 bushels; corn, 50 to 75 bushels; beans, 10 to 25 bushels; cabbage, 8 to 20 tons; and potatoes, 75 to 200 bushels, averaging about 125 bushels.

Corn is practically the only crop used for silage, and between one-fifth and one-fourth of the crop is used for that purpose. Two or three cuttings of alfalfa are obtained.

The general crop rotation consists of corn, beans, or potatoes followed by beans or oats, and in turn by wheat and a seeding to grass. Fields are left in grass from 2 to 4 or more years. Departures from this plan are many and varied, according to the character of farming and the needs of the individual farms. The available supply of manure is applied to sod land before plowing or is used for the top-dressing of hay land or land about to be plowed for wheat. Some commercial fertilizer is used. Modern farm machinery is in almost universal use.

Ontario loam is widely distributed south of the ridge. It occurs in only a few large areas but in numerous small ones. It is closely associated with the Clarkson soils in the western part of the county.

Areas occur near Adams Basin, around Garbutt, southeast of Riga Center, southeast of Riga road, southwest of Clifton and Belcoda, east of Pinnacle road, north and east of Penfield, about 3 miles northwest of Rochester, and in many other places.

The land is well drained and easily cultivated. It occupies nearly level, gently sloping, and moderately hilly areas. Therefore, control of erosion and the building up of the soil by the use of manures and legume crops is not difficult.

Ontario loam, rolling phase.—Distributed throughout the southern two-thirds of the county are numerous elongated hills, or drumlins, which have a general northeast or north-northeast trend, rising from 50 to more than 100 feet above the adjacent more level areas. These drumlins have steep but well-rounded slopes which are generally more pronounced at the northeastern end. The soil on the steeper ones has been indicated as a rolling phase of Ontario loam. This soil differs from typical Ontario loam in relief rather than in soil profile. The profile, however, does differ from the typical soil to some extent, as the compact layer occurs at less depth and the dark surface layer is not so thick.

The tops and sides of the drumlins are subject to considerable erosion, especially where clean cultivation is practiced, owing to steepness of slope, to the scouring effect of the gravel carried by the run-off, and to the compact character of the subsoil which does not absorb moisture rapidly. On steep drumlin slopes, where the land has been improperly managed, the surface soil in many places has been removed, bringing the compact subsoil near the surface. This, in places, is badly gullied, and deposits of soil material have accumulated at the bases of the slopes. Soil of this phase is mapped only on the steeper, more pronounced drumlins and in general where erosion has been active. It is used in about the same way as typical Ontario loam, but crop yields are somewhat lower.

This soil, like the typical soil, occurs in comparatively small widely distributed areas throughout the southern part of the county. Areas of this soil are north of Mumford, between Riga Center and Clifton, in the vicinity of Scottsville, and near the county line east of Penfield and east of Fairport.

These and all steep slopes in this section should be used for cultivated crops to as small extent as possible, and where so used the crop rows should be extended across the slope instead of up and down. The slopes should be used principally as grassland or planted

to forests. In some places on the more gentle slopes terracing, strip cropping, or both, might be used to advantage in checking erosion.

Ontario loam, broken phase.—Ontario loam, broken phase, consists of areas of Ontario loam having steep gullied slopes, from which the topsoil has been largely removed by erosion, leaving the very gravelly subsoil exposed at the surface or with but a very thin soil covering. Such areas in places occupy the steeper drumlin slopes. The land has no value as cultivated land and should be kept in grass or forest.

Ontario loam, yellow-subsoil phase.—Ontario loam, yellow-subsoil phase, differs from the typical soil principally in having a slightly lighter, more yellowish-brown or grayish-brown, surface soil and a yellowish-brown rather than a light-brown subsoil. In places this phase of soil seems to be slightly lighter in texture and more sandy, especially in the upper part of the subsoil. The sandstone gravel which it contains is in part of different origin from that in typical Ontario loam, as it is gray instead of red and is not so hard.

This soil occupies nearly level, undulating, and slightly hilly areas. It is productive for small grains and is well suited for growing beans, potatoes, corn, cabbage, and other market-garden crops common to this section.

Ontario loam, yellow-subsoil phase, occupies a much smaller total area and is less widely distributed than the typical soil. It occurs in comparatively small bodies in the section south of the ridge road between Irondequoit Bay and the eastern county line. In general, crop yields are about the same as on Ontario loam, but cabbage and tomatoes do better on this soil.

Ontario gravelly loam.—Ontario gravelly loam differs from Ontario loam principally in the larger content of gravel in the surface soil and subsoil. Practically all soils of the Ontario series contain small gravel fragments in the surface soil and upper part of the subsoil, and all have gravel in large quantities in the lower part of the subsoil. Except in areas where the gravel on the surface is very abundant, it does not interfere either with cultivation or crop production. Many of the smaller, more gravelly areas have been included with the surrounding soils, some being indicated by gravel symbols, but some of the more extensive areas have been separated as a gravelly soil. Most of the gravelly areas have a small-hill conformation. They occur principally between Spencerport and Churchville in the western part of the county. This soil has about the same crop adaptations as Ontario loam but, as a whole, is considered slightly less productive.

Ontario silt loam.—Ontario silt loam has almost the same profile as Ontario loam, but it differs from that soil in having less gravel in the surface soil and upper part of the subsoil and in having a slightly heavier texture. It occurs principally in small bodies of nearly level or slightly hilly relief. Crop adaptations are about the same as on Ontario loam, and the average yields are slightly higher. South of Webster this soil is used extensively for potatoes, beans, cabbage, corn, small grains, and apple orchards.

To a depth of about 8 inches, the soil is brown, dark grayish-brown, or slightly reddish brown silt loam which in most places contains some sharp sandstone gravel but usually less than Ontario loam. This layer is underlain by yellowish-brown light-textured loose friable silt loam which also contains gravel like that in the surface soil, and in places it is more abundant. At a depth ranging, in most places, from 24 to 36 inches, is a layer of compact, very gravelly material consisting largely of rock fragments, principally sandstone, but with some limestone and crystalline rocks of foreign origin, most of which are larger than the sandstone gravel. This compact layer ranges from only a few inches to more than a foot in thickness, and it is underlain by unassorted gravelly till.

The surface soil and upper subsoil layer give an acid reaction, but the lower subsoil layer, at a depth of about 30 inches, effervesces freely with acid.

This soil is closely associated with the other Ontario soils, and it also occurs in small, widely distributed areas. One area is about 2 miles north of Fairport, and several small bodies are in the eastern part of the county.

Ontario fine sandy loam.—Ontario fine sandy loam is one of the extensively developed types of the Ontario series, and it occurs throughout the southern and southeastern parts of the county, both on drumlins and on the more nearly level areas between drumlins.

The surface soil is slightly lighter brown than that of Ontario loam or Ontario silt loam, and this soil is less gravelly on the surface than the loam. The sand is finer and smoother.

This soil consists of brown or light-brown fine sandy loam which is comparatively free from gravel to a depth of about 8 inches, below which it grades into lighter brown slightly heavier fine sandy loam containing more gravel. This material, in turn, is underlain, at a depth ranging from 24 to 30 inches, by a compact very gravelly layer which ranges in thickness from 8 to 24 inches and is underlain by unassorted fine sandy till.

The surface soil is slightly acid, the upper subsoil layer about neutral, and the lower subsoil layer at a depth of about 30 inches effervesces freely with acid.

This soil is used to considerable extent for growing small grains, corn, potatoes, clover, and alfalfa and to some extent for growing apples. Alfalfa yields from 1¾ to 2½ tons an acre; clover, 1½ to 2 tons; wheat, 15 to 30 bushels; oats, 30 to 65 bushels; corn, 30 to 60 bushels; potatoes, 75 to 200 bushels; cabbage, 12 to 15 tons; and tomatoes, 10 to 18 tons.

Ontario fine sandy loam, rolling phase.—The rolling phase of Ontario fine sandy loam bears the same relation to the typical soil that the rolling phase of Ontario loam does to the typical loam. It occurs on the crests and steeper slopes of drumlins, where erosion is active when the land is cultivated and where the surface soil has been gullied or removed and the compact deep subsoil is at or near the surface. Land of this phase should, to as great an extent as possible, be used for grassland or forest. Crop yields as a whole are lower than on the typical fine sandy loam.

Ontario fine sandy loam, yellow-subsoil phase.—The yellow-subsoil phase of Ontario fine sandy loam differs from typical On-

tario fine sandy loam principally in having a slightly lighter, more yellowish brown or grayish brown, surface soil and a yellowish-brown rather than a light-brown subsoil. In places this soil seems to be slightly lighter in texture and more sandy, especially in the upper part of the subsoil. The sandstone gravel which it contains is, in part, of different origin from that of typical Ontario fine sandy loam. It is gray instead of red and not so hard.

This soil occupies nearly level, undulating, and slightly rolling areas. It is productive for small grains and is well suited for growing beans, potatoes, cabbage, and other market-garden crops suited to this section. It holds moisture a little better than typical Ontario fine sandy loam.

Ontario fine sandy loam, yellow-subsoil phase, occurs in small areas, principally in the east-central part of the county. It is closely associated with the other Ontario soils. An area lies near the Rochester Country Club, another south of Webster, one body is near the county line southeast of Webster, and several are southeast of Spencerport.

Ontario loamy fine sand.—Ontario loamy fine sand has a brown or light-brown loamy fine sand surface soil, free or nearly free of gravel, and a subsoil like that of Ontario fine sandy loam. It is associated with the soils of the Ottawa and Berrien series and in places has been modified by wind-blown sand.

The most extensive areas are in the southeastern part of the county in the vicinity of Fairport. Bodies lie south of Brockport and in other parts. This soil is fairly well suited for growing small grains, beans, and truck crops. Crop yields are lower than on Ontario fine sandy loam.

Honeoye loam.—The 8-inch surface soil of Honeoye loam is dark grayish-brown medium-textured or heavy loam containing some gravel. It forms moderately hard clods in cultivated fields. It is underlain by lighter brown loam which is very slightly mottled with gray and grades into compact clay loam. Below a depth of 15 inches is a more reddish brown compact gravelly clay loam which becomes slightly more reddish brown and less compact below a depth of 20 inches. In places, the surface soil has a pH value of 7 but does not effervesce with acid, and in other places the soil effervesces at or near the surface.

The relief is undulating, drainage is good, and crops, especially clover, sweetclover, and alfalfa, seem to do better than on most other soils of this section. Small grains, beans, cabbage, tomatoes, and other crops return good yields. Wheat yields from 20 to 25 bushels an acre; oats, 50 to 75 bushels; barley, 25 to 35 bushels; rye, 15 to 20 bushels; corn, 50 to 80 bushels; potatoes, 100 to 175 bushels; and beans, 15 to 25 bushels. Hay crops do well, especially the legumes. Alfalfa and clover produce from 2½ to 4 tons of hay an acre and timothy 1¼ to 1½ tons. Yields of cabbage range from 10 to 12 tons. The yields of general farm crops are slightly higher than on other soils of the county.

From Riga Center an area of Honeoye loam extends westward along the Riga Center road. Several large areas are in the western

part south of Brockport, and several smaller bodies are in the vicinity of Henrietta.

Stone fences in this part of the county contain a high percentage of limestone. The glacial till from which this soil has developed is calcareous, and for this reason the land is especially suited for alfalfa, clover, sweetclover, and other crops requiring a sweet soil.

Honeoye loam, shallow phase.—To a depth of 8 inches the shallow phase of Honeoye loam consists of dark grayish-brown heavy loam or silt loam containing some gravel. This layer is underlain by lighter brown loam or silt loam, slightly mottled with light gray and rusty brown, and it grades below a depth of 15 inches into clay loam. This soil forms hard clods in cultivated fields, and blocky fragments of limestone are scattered over the surface. Limestone is reached at a slight depth under the thin covering of till, and in places it outcrops at the surface. The surface soil has a pH value of about 7, and in places it effervesces at only a slight depth below the surface.

This soil differs from the typical soil in having a darker surface soil of heavier texture and less depth. It also is not so well drained.

Crop adaptations are about the same as on the typical soil, but yields are not so good.

Several large areas of this soil are south of Brockport.

Honeoye silt loam, shallow phase.—The shallow phase of Honeoye silt loam differs from the shallow phase of Honeoye loam in having a somewhat heavier more silty texture and, as a rule, it has less gravel and stone on the surface. It is closely associated with the shallow phase of Honeoye loam. Crop yields are about the same as on that soil. Only a small area is mapped.

Worth loam.—Worth loam is brown or light-brown somewhat gravelly friable loam to a depth of about 8 inches. Below this the color is slightly lighter brown or yellowish brown and the texture slightly more sandy. At an average depth of about 24 inches this material rests on more compact very gravelly till consisting principally of dull-red or brown sandstone material. This is less compact below a depth of about 3 feet, and, as a whole, seems slightly less compact than the lower part of the subsoil of the Ontario soils. Worth loam is strongly acid throughout the surface soil and subsoil. The parent material will not effervesce with hydrochloric acid. It is not suited for growing alfalfa or clover, but for nonlegume crops it is moderately productive.

The Worth soils occur principally north of the ridge in the northeastern part of the county, but a few areas extend south of the ridge. One of these lies near Roseland southeast of Webster. The relief is rather broken and is characterized by level areas, undulating areas, and small rocky hills.

Fair average yields of crops are obtained, but they are somewhat lower than on Ontario loam and its phases. Hay yields from 1 to 1½ tons an acre; wheat, 15 to 20 bushels; beans, 10 to 20 bushels; oats, 25 to 50 bushels; corn, 20 to 35 bushels; and potatoes, 75 to 150 bushels. This land is not used for clover or alfalfa, and it is used to only a slight extent for apple orchards.

Under recent economic conditions, less lime has been used on this soil, and this has been accompanied by a reduction in the acre-

age devoted to legume crops and a general deterioration of all crops grown.

Worth loam, brown-subsoil phase.—The brown-subsoil phase of Worth loam is reddish-brown gravelly loam containing a rather large quantity of dull-red sandstone gravel in the surface soil and larger quantities in the subsoil. The dark reddish-brown surface soil extends to a depth of about 8 inches and is underlain by a lighter red gravelly subsoil which, at a depth of about 24 inches, rests on compact very gravelly till. Below a depth of about 3 feet, the material is less compact and is filled with fragments of slightly more calcareous red sandstone. The surface soil is acid, but the lower part of the subsoil is approximately neutral.

This soil differs but slightly from the typical soil in crop adaptations or yields.

Worth fine sandy loam.—Worth fine sandy loam differs from Worth loam principally in texture. It is slightly more loose and friable, owing to its higher content of fine sand and very fine sand. For potatoes and garden and truck crops it is slightly preferable, but for the general farm crops its value differs little from that of the loam. Only comparatively small areas of this soil in the southern part of the county in the vicinity of Rush are shown on the soil map.

Worth gravelly loam, brown phase.—The 6-inch surface layer of Worth gravelly loam, brown phase, consists of dark slightly reddish brown gravelly loam which breaks into small rather hard clods. It is underlain by reddish-brown gravelly loam or silt loam, which breaks into small sharp hard clods about one-half inch in diameter. This material, in turn, is underlain at an average depth of about 16 inches by dull-red very compact till which breaks into large irregular masses and in places is slightly mottled with gray. Below a depth of 30 inches is dull-red compact clay loam or clay till. The surface soil and subsoil are strongly acid, the pH value being between 5 and 5.8.

Worth gravelly fine sandy loam, brown phase.—The topsoil of Worth gravelly fine sandy loam, brown phase, consists of dark slightly reddish brown fine sandy loam which is finely granular and full of roots to a depth of about 3 inches, and below this is slightly reddish brown gravelly fine sandy loam which breaks into small irregular easily crumbled clods. This material, in turn, is underlain by dull reddish-brown or purplish-brown loam till of massive structure, which, below a depth of 20 inches, is very compact and contains many large rocks. The surface soil is strongly acid, but the lower part of the subsoil has a pH value of approximately 7.

This soil occurs in the northeastern part of the county, north of the ridge. The relief is of the small-hill type and rather rough. The gravel in both surface soil and subsoil consists of dull-red sandstone.

This soil is used mainly for general farming. All crops common to the county, except clover and alfalfa, are grown on it, but yields seem to be rather low. Some areas are in forest.

Worth stony loam, brown phase, and Worth stony fine sandy loam, brown phase.—These soils are closely associated with the brown-subsoil phase of Worth loam and the brown phase of Worth gravelly fine sandy loam. They differ from those two soils principally in that the surface is thickly covered with pieces of thin hard

shaly, or slabby, sandstone. Sandstone in the same form is also present in the subsoil and substratum. Stone fences, built from this material picked from the fields, are abundant. The large quantity of sandstone slabs on the surface and in the soil interferes to some extent with cultivation and also makes the land slightly less productive. The principal areas are in the eastern part of the county north of Webster. Near the ridge north of Webster a few small bodies, in which the sandstone fragments are small and not very abundant, have been included with these soils as mapped. Crop yields are rather low, particularly on the lighter textured soil. Wheat yields from 10 to 15 bushels an acre, oats 20 to 40 bushels, corn 20 to 30 bushels, and potatoes 75 to 100 bushels.

Clarkson loam.—Clarkson loam consists of dark slightly reddish brown loam of fine light texture to a depth of 6 inches. Below this, and extending to a depth of about 16 inches, the material is slightly more reddish brown and somewhat mottled with gray in the lower part. Below this depth it grades into reddish-brown friable loam free from mottlings. Below a depth of 24 inches is dull Indian-red heavy compact loam or clay loam, containing much sharp shale and sandstone gravel, and below a depth of 34 inches the material is very compact. In places the mottled layer is not developed or only slightly so. This soil is about neutral near the surface, the pH value being 7; at a depth of 18 inches it is slightly acid; and at a depth of 30 inches it effervesces freely with acid.

This soil is used extensively for apple orchards, for tomatoes, beans, and similar crops, and to some extent for alfalfa. Where well handled it is fairly productive, but yields are generally lower than on the gravelly loam.

Clarkson loam and Clarkson gravelly loam are developed principally immediately south of the ridge in the western part of the county, and smaller areas are in other parts. The relief is undulating or rolling. Wheat yields from 15 to 30 bushels an acre; oats, 30 to 60 bushels; corn, 30 to 65 bushels; cabbage, 8 to 12 tons; tomatoes, 6 to 12 tons; clover, 1½ to 2 tons; and alfalfa, 1¾ to 2½ tons.

Clarkson gravelly loam.—Clarkson gravelly loam consists of dark slightly reddish brown gravelly loam of fine texture to a depth of about 6 inches. Below this and extending to a depth of about 16 inches is the subsoil of slightly lighter reddish brown gravelly loam somewhat mottled with light gray and rusty brown in the lower part. Below a depth of 24 inches the material is dull Indian-red heavy compact loam or clay loam, containing much red sharp sandstone gravel and dull-red soft shale. Below a depth of about 30 inches, this material is very compact. In places the mottled layer is not developed or only slightly so. This soil is about neutral in reaction near the surface, the pH value being 7, at a depth of 18 inches it is slightly acid, but at a depth of 30 inches it effervesces freely with acid.

This soil differs from Clarkson loam in its larger content of gravel in the surface soil, in having more rolling relief and in being as a whole slightly more productive. It has about the same crop adaptation. In places it supports some good apple orchards. It is used for small grains, corn, tomatoes, cabbage, clover, and alfalfa, and yields are but slightly better than those on the loam.

Clarkson loam, shallow phase.—The shallow phase of Clarkson loam, to a depth of 6 inches, consists of dark slightly reddish brown gravelly loam of fine texture. Below this and continuing to a depth of about 15 inches, the subsoil is slightly lighter reddish brown material somewhat mottled with light gray and rusty brown in the lower part. Below a depth of about 24 inches is dull Indian-red compact very gravelly loam or clay loam, the gravel consisting of red sandstone and dull-red shale. This material, at a depth of 30 inches or less, rests on unweathered beds of sandstone and shale.

For grass, small grains, and other field crops this is a moderately productive soil, but for apples and other tree fruits it is less desirable than soils which allow deeper rooting.

Hilton fine sandy loam.—Hilton fine sandy loam consists of brown or slightly reddish brown fine sandy loam to a depth of about 8 inches, below which the material is slightly lighter brown and the texture somewhat more sandy. This layer extends to an average depth of about 24 inches. The lower part of it is grayish brown mottled with spots of light gray and rusty brown. Below this is a compact very gravelly layer ranging from 6 to 15 inches in thickness. The deep substratum also is very gravelly but not compact. Much of this soil is gravelly near the surface, but some of it, especially that occurring on the tops of low hills and mounds, has a covering of loose fine sand, probably of wind-blown origin.

The Hilton soils are more extensively developed north of the ridge and west of Rochester, and they are well developed in the vicinity of Hilton. South of the ridge are numerous small but scattered areas. This soil occurs principally on the crests of low hills and ridges.

This soil is used for nearly all the crops commonly grown, and fair yields are obtained. It is used especially for peach and cherry orchards, for which it is well suited.

Hilton fine sandy loam, heavy-subsoil phase.—The heavy-subsoil phase of Hilton fine sandy loam differs from the typical soil in having the light-gray or mottled gray and rust-brown layer more strongly developed; in having a more compact layer in the lower part of the subsoil; in containing water-worn material which is more or less stratified; and in having a level or nearly level relief.

On account of the heavy subsoil layers, this soil, although extensively used for orchards, is not so well suited for this purpose as is the typical soil. For small grains and shallow-rooted crops, yields are about the same as those obtained on the typical soil. For crops requiring better drainage, yields are slightly lower.

Hilton gravelly loam.—The 8-inch surface layer of Hilton gravelly loam consists of brown or dark reddish-brown gravelly loam. It is underlain, to a depth of about 24 inches, by lighter brown gravelly loam which is slightly more sandy. The lower part of this layer is somewhat gray and contains mottlings or small spots of light gray and rusty brown. Below an average depth of about 24 inches is a very compact layer of glacial till consisting of sharp sandstone fragments, larger pieces of sandstone, and a small quantity of limestone and crystalline cobbles firmly embedded in fine sand, silt, and sandy clay. This material is so compact that it checks the downward movement of moisture, resulting in an imperfectly drained

subsoil. The compact layer does not occur at a uniform depth, and is not of uniform thickness. Below it is the deep substratum consisting of very gravelly but not compact till.

This soil occupies low, broad, or well-rounded ridges and nearly level areas.

In a few small widely distributed bodies the gravel is so abundant on the surface and in the soil that it interferes to some extent with cultivation, but in most areas it is not seriously harmful. This soil has been used extensively for orchards, especially in the lake plain, and for nearly all crops commonly grown in this section.

Although used extensively for orchards, and although fair results are obtained, recent studies [5] show that on soils of this character the average depth of rooting is only about 30 inches, whereas on soils with less compact subsoils rooting is much deeper, resulting in larger and more uniform production.

Practically all of the native timber has been removed from this soil which is used as hay and pasture land, for orchards, corn, oats, wheat, beans, cabbage, and tomatoes.

Hay, consisting principally of timothy and clover, yields from 1½ to 2 tons an acre; corn, 30 to 50 bushels; oats, 35 to 60 bushels; wheat, 20 to 30 bushels; cabbage, 8 to 15 tons; and tomatoes, 8 to 15 tons. Alfalfa is grown to only a limited extent, and the soil is not regarded as a very good potato soil.

Hilton gravelly loam, heavy-subsoil phase.—The heavy-subsoil phase of Hilton gravelly loam consists of dark-brown or dark grayish-brown gravelly loam to a depth of about 8 inches, where it is underlain to a depth of about 24 inches by lighter brown gravelly loam. In the lower part of this layer are mottlings or spots of light gray and rusty brown. Below an average depth of about 24 inches is a very compact layer of till consisting of small sharp pieces of sandstone, larger pieces of sandstone, and a small quantity of limestone and crystalline cobbles. In places there are thin layers of rounded water-worn gravel. This material is so compact that it checks the downward movement of moisture, resulting in an imperfectly drained subsoil. This compact layer does not occur at a uniform depth and is not of uniform thickness. Below it is the deep substratum of very gravelly but not compact till.

This soil differs from typical Hilton gravelly loam in the slightly darker color and heavier texture of the surface soil. It also occurs in more nearly level or flat areas and in places contains layers of rounded gravel in the subsoil or substratum.

The soil has nearly the same crop adaptation as Hilton gravelly loam. It is also used for orchards but for these is not well suited. It occurs in close association with the typical soil.

Hilton gravelly loam, shallow phase.—The shallow phase of Hilton gravelly loam consists of a thin layer of brown, reddish-brown, or dull-red gravelly loam underlain at various depths by residual material consisting of partly weathered dull-red or olive-green sandy shale and sandstone, or, in places where reworked, stratified till and water-worn sand and gravel. Some areas near the ridge have much water-worn gravel mixed through the surface soil. In other places

[5] See footnote 4, p. 12.

the soil has the deep dull-red color of the Clarkson soils and in a few places is nearly free from gravel. Soil of this phase is moderately productive for the common farm crops and has been used to some extent for apples, to which it is not so well suited. It has a pH value of 6 at the surface, pH 5 to a depth of 24 inches, and pH 8 in the lower part of the subsoil.

Areas of Hilton gravelly loam, shallow phase, lie immediately north of the ridge, extending from Greece to the western boundary of the county.

LIGHT-BROWN, BROWN, AND REDDISH-BROWN SOILS WITH STRATIFIED SUBSOILS

The soils of this group include light-brown, brown, and reddish-brown soils, free or nearly free from gravel, with clearly stratified subsoils and substrata, in which layers of silt and clay alternate with thin layers of sandier material. These soils occupy level or nearly level areas lying at widely different elevations. In places the material from which the soils have been formed is so thin that the gravelly till may be reached in the subsoil. In places gravel occurs on the surface, and in other places gravel and even boulders of considerable size are embedded in the subsoil. These are believed to have been dropped from melting ice, floating in the glacial lakes, at the time the sediments were being deposited.

Soils of the Dunkirk series are characterized by their uniform light-brown or yellowish-brown color and by a substratum of alternating layers of silt, clay, and sandier material. They are nearly level but are well drained, alkaline in the subsoil, and highly productive.

The Collamer soils are light brown or grayish brown in the surface soil, have a moderately or strongly developed gray and mottled layer, and have a deep subsoil which at rather widely varying depths restricts underdrainage. These soils are closely related to the soils of the Dunkirk series, have developed from old lake-laid material, and are used extensively for apple orchards and for numerous other crops. They differ from the Dunkirk soils in their somewhat lighter brown color, more strongly developed gray and mottled layer, less well drained deep subsoil, and, as a rule, more nearly level relief.

The Lucas soils are gray or olive gray, have a fairly well developed gray layer at a slight depth, and have a gray thinly stratified clay subsoil which, on drying, breaks with a blocky structure. The Lucas soils occupy nearly level areas and closely resemble the Hudson soils mapped in the eastern part of the State.

Soils of the Berrien series are brown or slightly reddish brown, light in texture, and loose and friable near the surface. The subsoil is lighter brown and more or less mottled with rusty brown and light gray. This layer is underlain, at a depth of 30 or more inches, by stratified layers of sand and clay. The relief ranges from nearly level to gently undulating.

Soils of the Schoharie series have brown, grayish-brown, or grayish-red surface soils and dull Indian-red subsoils. In this series, soils of heavy texture predominate, and in them a thinly developed light-gray or gray and rusty-brown mottled layer occurs at a depth ranging from 6 to 10 inches below the surface. Below this layer is dull-red clay which breaks into large somewhat regular clods, and

the cloddy structure continues to a depth of about 3 feet. Below this is dull-red massive clay alternating with layers of dull-red sandy soil. The surface soil is about neutral or slightly acid, but the lower part of the subsoil effervesces freely with acid.

Soils of the Fulton series have gray or dark-gray surface soils, lighter gray upper subsoil layers mottled with yellowish brown in the lower part, and very heavy gray or olive-gray clay lower subsoil layers which are stratified and alkaline. Soils of this series have surface soils much like those of the Collamer soils, or slightly darker, and the upper and lower subsoil layers are like those of the Lucas soils.

Soils of the Arkport series are brown or light brown, sandy, and have an uneven undulating relief. The upper subsoil layers consist of loamy fine sand, through which are thin uneven layers of compact sandy clay, and the lower subsoil layers consist of loamy sand or fine sand. The surface soils and subsoils are alkaline, and the lower subsoil layers effervesce freely with acid.

Soils of the Ottawa series are brown or light brown and have a light sandy texture, loose consistence, and are acid. They differ from the Arkport soils in having no or only very slight development of sandy clay layers in the subsoil and in being acid rather than alkaline in both surface soil and subsoil.

Soils of the Petoskey series are brown or light brown, sandy, free from layers of heavy material or nearly so, occupy nearly level areas, and are alkaline from near the surface downward, the subsoils effervescing freely with acid.

Dunkirk silt loam.—Dunkirk silt loam, as mapped, has a 6-inch brown, light-brown, or slightly grayish brown silty surface layer, below which the material grades into lighter brown soil of about the same texture, which extends to a depth of 12 inches. Below this depth the material tends to be slightly more grayish brown, with small patches of light-gray and rusty-brown mottlings which are most pronounced in the lower part of the layer. The upper two layers are fairly uniform in thickness, but the lighter colored (third) layer is very uneven, especially along the lower side, ranging in thickness from only a few inches to more than 2 feet. Below an average depth of 30 inches are thin layers of silt, pink or slightly red silty clay, and very fine sand. This lower part of the subsoil is variable and in most places, at a depth of 6 feet or more, rests on very compact fine sand, silt, or till.

The surface soil is nearly neutral, the subsoil to a depth of about 30 inches is slightly acid, and the lower part of the subsoil is alkaline, in most places effervescing freely with acid at a depth ranging from 4 to 6 feet.

This soil occupies low ridges, rather indefinite terraces associated with the large streams, except Genesee River, and broad but fairly well drained uplands. It is used for all the crops commonly grown in this section and seems especially well suited for apple orchards, for which it is used extensively. Surface drainage of most of the land is good, and underdrainage is better than in many other soils of the county.

This soil has developed from silty water-laid material, but in places on the surface and to some extent through the surface soil

and subsoil, the material contains some sharp gravel, principally of red sandstone like that of the adjacent till. This gravel was probably dropped from ice following the retreat of the main ice sheet. Where the gravel is abundant it has been indicated on the soil map by gravel symbols.

Owing to its favorable texture, friable consistence, thorough drainage, and abundant supply of plant nutrients, this is one of the best soils in this county and is well suited to a wide range of crops.

It is one of the most highly productive soils for apples and is well suited for all other crops of this section. It is well improved and well farmed (pl. 1, *B*). In addition to the large acreage devoted to orchards, the land is used extensively for wheat, corn, tomatoes, and some other crops. Although it is well suited for clover and alfalfa, these crops are not grown to so great an extent as on the Ontario, Honeoye, or Palmyra soils. Wheat yields from 20 to 30 bushels an acre; oats, 30 to 50 bushels; corn, 25 to 45 bushels; beans, 15 to 20 bushels; and potatoes, 75 to 150 bushels.

In a number of places the surface soil and upper subsoil layer of Dunkirk silt loam are lighter, more grayish brown, than the typical soil, and the lower part of the subsoil is more yellowish brown. A rather large area of this kind occupies the nearly level uplands a short distance west of Genesee River north of the Latta road. This soil is more strongly alkaline than typical Dunkirk silt loam, the surface soil and upper subsoil material having a pH value of 8.

Samples of this soil from the western part of the county show the following pH values: 0 to 12 inches, pH 7; 12 to 24 inches, pH 6.3; 24 to 36 inches, pH 6; 36 to 48 inches, pH 7; 48 to 60 inches, pH 7.3; 60 to 72 inches, pH 8.

In a roadside cut where the Greenleaf road crosses the railroad, the exposed soil, to a depth of 2 inches, is dark grayish-brown finely granular silt loam and below this, to a depth of 9 inches, is light grayish-brown silt loam with a small-clod structure. Between depths of 9 and 15 inches, the material is gray and rust-brown silty clay loam containing a few soft rust-brown concretions. Between depths of 15 and 24 inches is light yellowish-gray and rust-brown heavy silt loam or silty clay loam, and below a depth of 24 inches is gray silty clay, with a pink tint, that is thinly stratified. This material effervesces freely with acid. Such areas seem to be intermediate between Dunkirk silt loam and Collamer silt loam.

Dunkirk silt loam is extensively developed between a point a few miles north of the ridge and the lake. It occupies a rather large area near Manitou Beach and Braddock Bay and numerous smaller areas. A number of small areas are along the Hill road south of Collamer, along the Burritt road, and along the Butcher road. In the eastern part of the county fair-sized bodies are near the lake shore between Forest Lawn and Ninemile Point, and extensive areas are between West Webster and Penfield.

Dunkirk silt loam, broken phase.—The broken phase of Dunkirk silt loam is less uniform in texture than the typical soil, and it includes numerous areas of fine sandy loam and very fine sandy loam and others in which very heavy silt loam is reached at a slight depth. It occupies steep slopes and narrow sharp ridges, many of which are too steep for profitable cultivation, although some of the land has been cultivated and some has been terraced and used for grapes.

The principal areas of this soil lie between Titus Avenue north of Rochester and the Durand-Eastman Park, and some bodies are in the vicinity of Penfield. The soil is used for pasture in places, but it can best be used for forest.

Dunkirk fine sandy loam.—The 8-inch surface soil of Dunkirk fine sandy loam consists of brown light fine sandy loam. It is underlain by lighter brown or yellowish-brown fine sandy loam of heavier texture, continuing to a depth of about 30 inches, below which are thin layers of brown or reddish-brown silt and clay alternating with more sandy material. The material in the deep substratum effervesces with acid. This soil, although not extensive, is well suited for growing truck crops, small fruits, orchards, and other crops common to Dunkirk silt loam.

Only one area of this soil is outlined on the soil map. It lies north of Honeoye Falls around Mendon Center.

Collamer silt loam.—Collamer silt loam consists of gray or dark-gray silt loam to a depth of about 6 inches, below which is lighter gray silt loam or fine sandy loam, the lower part of which is in most places very uneven but extends to an average depth of about 12 inches. Below this, and extending to a depth ranging from 18 to 24 inches, is a layer of light-gray silt, strongly mottled with rusty brown, underlain by brown or reddish-brown sandy clay, silt, and very fine sand. This deep subsoil material is stratified, but the strata are in many places twisted and bent, and some layers are so compact that they resist moisture and root penetration.

Collamer silt loam is closely associated with Dunkirk silt loam and is widely distributed in small areas north of the ridge. A fair-sized area lies along the Collamer road west of Hilton, and numerous areas are west of Genesee River in the western part of the county. There are only a few areas south of the ridge.

This soil is used for all crops grown in the county and is extensively used for apple orchards, some of which have received good care, have good surface drainage, and are highly productive.

The relief is flat. Yields of wheat, hay, and oats are about the same as on Dunkirk silt loam. Where good surface drainage is not provided, yields are low, and the orchards die prematurely.

Collamer silt loam, light-textured phase.—Collamer silt loam, light-textured phase, differs from the typical soil in that it is lighter in texture and, as a rule, has a somewhat less strongly developed gray layer and a slightly less compact lower subsoil layer. It is an intermediate soil between the Collamer and Dunkirk soils. Crop yields are as a rule slightly higher than on typical Collamer silt loam.

In a deep excavation near the Holt road this soil, to a depth of 6 inches, is dark grayish-brown silt loam of light texture. It grades into lighter colored, more yellowish brown, silt loam. Below a depth of 12 inches this material changes to lighter yellowish-brown or light-gray silt loam mottled with rusty brown; and below a depth of 24 inches, this material, in turn, is underlain by brown compact sandy clay which varies greatly in thickness and is underlain by very compact fine sandy loam or fine sand. The surface soil is neutral and the subsoil, below a depth of 24 inches, is alkaline.

Collamer silt loam, poorly drained phase.—Collamer silt loam, poorly drained phase, is intermediate between the Collamer and Granby soils. The surface soil is darker gray than that of the typical soil, and the gray layer is developed at less depth. Mottling of rusty brown in the horizon below the gray layer is pronounced.

Soil of this phase occupies broad slightly depressed areas, the lower less well drained parts of which are occupied by the Granby soils. The land is not suited to orchard plantings and is less well suited to other crops than is typical Collamer silt loam.

This soil is associated with Collamer silt loam throughout the western part of the county, most of the areas occurring as long narrow belts, many of them lying between areas of Granby sand and the typical Collamer soils. This soil is used to some extent in the production of pears and quinces, but its principal use is as hay and pasture land.

Collamer silty clay loam.—Collamer silty clay loam is gray or dark-gray heavy silt or silty clay loam to a depth of about 6 inches, below which the material grades into lighter gray silty clay loam that extends to a depth of about 18 inches and is strongly mottled with yellow and rusty brown in the lower part. Below this are thin layers of clay and sandy material, in places sharply tilted or strongly bent. Drainage is not so good in this soil as in Collamer silt loam, and the land is not so well suited for apple orchards. It is very well suited for grass, small grains, and cabbage.

Lucas silty clay loam.—Lucas silty clay loam consists of dark grayish-brown heavy silt loam, in which the surface material is granular, but below the thin surface film it is thinly laminated. At a depth of about 4 inches this material grades into yellowish-brown silt loam with a small-clod structure, which is underlain at a depth of about 7 inches by yellowish-brown or light-gray heavy silt loam mottled with rusty brown. This layer is thin and is underlain at a depth of about 11 inches by dull dark-brown or grayish-brown clay which breaks into hard irregular clods, ranging from one-half inch to 2 inches in diameter, and shows a slight trace of vertical cleavage. The subsoil is heavy tenacious clay which breaks into large blocks, ranging from 1 inch to 3 inches in diameter. Approximately this same material extends to a depth ranging from 8 to 10 feet. It is clearly stratified, but the clods do not break along lines of deposition.

A sample of the surface soil has a pH value of about 7.3; of the gray layer, 6.8; of the subsoil to a depth of about 30 inches, 7.5; and the lower part of the subsoil, below a depth of 30 inches, effervesces freely with acid.

This soil has nearly level relief. It is used for orchards (mainly apples), alfalfa, cabbage, and other crops. Owing to its heavy texture, it is heavy to work, and the growth of crops is slow. This is not a first-class soil for orchards.

In this soil, tree roots were found at a depth of nearly 10 feet, the greater number following downward along cleavage planes, but, on account of the heavy soil texture, tree growth is slow and the soil is refractory under cultivation. Only one area, in the extreme northeastern part of the county along the lake front, is mapped.

Berrien fine sandy loam.—Berrien fine sandy loam is dark-brown or brown light fine sandy loam, in which a high percentage of the sand is very fine. Below a depth of 4 or 5 inches, this material grades into lighter brown or more yellowish brown light fine sandy loam of massive structure, very slightly compact, and extending to a depth of about 16 inches. Below this and continuing to a depth ranging from about 24 to 30 inches, but with wide variations as to thickness, is a zone in which the fine sandy loam is slightly lighter brown or grayish brown, with poorly defined patches of gray and indistinct mottlings of rusty brown, together with a few soft concretions in the lower part. Below this is heavy slightly red silty clay, silt, and fine sand, in thin layers similar to those in the lower subsoil layers of the Dunkirk soils. This material is underlain, in most places at a depth of several feet, by the typical reddish-brown sandy till or reworked till of this section.

This soil occupies nearly level areas and outwash plains. In many places the surface soil has been modified by a thin surface covering of wind-blown very fine sand. It is associated with the larger streams of the county and is most extensively developed adjacent to the valleys of the streams. It is probably of more recent origin than the heavier soils of the Dunkirk and Collamer series.

Included with this soil as mapped are small bodies of more reddish brown light loam or fine sandy loam, which are intermediate between this soil and Dunkirk silt loam.

Berrien fine sandy loam is used for practically all crops grown in the county. It is used extensively for apple orchards and is considered one of the better soils for this purpose. It is also used for small fruits, wheat, oats, and corn, but yields are low unless the land is well fertilized.

This soil has a wide distribution throughout the northern part of the county. A rather large area lies along the Jacobs road northeast of Morton. Several fair-sized bodies are northeast of Webster, and one lies east of the Bay road east of Irondequoit Bay.

Berrien fine sandy loam, imperfectly drained phase.—The imperfectly drained phase of Berrien fine sandy loam is intermediate in position, development, and crop value between the typical Berrien and the Granby soils. It occupies nearly flat and slightly depressed imperfectly or poorly drained areas and in places narrow belts adjacent to such areas.

The surface soil consists of dark-brown light finely granular fine sandy loam grading into slightly heavier fine sandy loam which extends to a depth of about 12 inches. Below this is a layer, 6 or 8 inches thick, of light yellowish-brown or grayish-brown fine sandy loam of light texture, mottled with rusty brown in the lower part and containing some dark-brown soft concretions in places. Below this is reddish-brown or yellowish-brown fine sandy loam of heavier texture, containing soft dark-brown concretions and in places thin cemented layers in the upper part. This soil is used for the general farm crops of the county, and has, in places, been planted to orchards, but it is not well suited for the latter purpose.

Berrien loamy fine sand.—Berrien loamy fine sand differs from Berrien fine sandy loam in having a slightly larger proportion of wind-blown loamy fine sand and very fine sand in the surface soil

and greater depth to the heavy subsoil layer which occurs at a depth ranging from 3 to 5 feet.

The 10- to 12-inch surface soil consists of brown loose loamy fine sand or very fine sand. It is underlain by lighter brown or more yellowish brown loamy fine sand extending to a depth of about 3 feet, below which is more grayish brown loamy fine sand. This material, at various depths below 4 feet, is underlain by heavier silt or clay or by gravelly till. The surface soil seems to be made up largely of wind-blown fine sand, and the gray mottlings characteristic of the subsoil of Berrien fine sandy loam are lacking or less pronounced. The surface soil is slightly acid, but the gray layer in the lower part of the subsoil in many places effervesces with acid.

The land is used for the same crops as are grown on Berrien fine sandy loam. The fruit produced is well colored, and it matures at an earlier date than on a soil with a heavier subsoil.

As observed in a deep excavation in an orchard north of Kendall Mills, this soil consists of a thin layer of brown light loamy very fine sand which becomes slightly lighter with depth. Between depths of 5 and 24 inches is light yellowish-brown loamy very fine sand of light texture and massive structure, free from mottling. Between depths of 24 and 60 inches is light-brown very fine sandy loam of light texture and massive structure, marbled with rusty brown but not distinctly mottled. Below a depth of 60 inches is dull Indian-red very fine sandy loam and grayish-brown rather compact fine sandy loam in thin alternating layers. In places irregular masses of brown sandy clay occur at a depth ranging from 3 to 5 feet.

Included with this soil as mapped are areas in which the surface soil contains some small gravel and coarse sand and in which the lower subsoil layer has better drainage than much of the land. A body of this kind is adjacent to a body of Alton coarse sandy loam northeast of Morton, and a few other areas are mapped.

This soil is intermediate between the Dunkirk and Petoskey soils but is more closely related to the Petoskey. It is used to some extent for apple orchards but to a greater extent for cherries and peaches. On account of its light texture, fertilization with manure is beneficial and necessary.

A rather large area of Berrien loamy fine sand extends along each side of Nine Mile road north of Webster and east of the Bay road north of West Webster. Numerous small areas are distributed throughout the northeastern part of the county, especially along the west side of Genesee River near Rochester.

Schoharie silty clay loam.—Schoharie silty clay loam has a 6-inch brown or reddish-brown heavy silt loam or silty clay loam surface layer which is underlain by light grayish-brown silty soil mottled with rusty brown and extending to a depth of about 10 inches. Beneath this is dull Indian-red clay which, in roadside cuts and gully banks, breaks into hard irregular clods ranging from one-half to 1 inch in diameter in the upper part of the layer but are larger in the lower part. Below a depth of 36 inches the cloddy structure is less marked. The substratum consists of alternating layers of red clay and sandier material, and in places the clay occurs in irregular masses surrounded by the red sandier material.

The relief is level or nearly level, and in places the soil occupies high terraces above some of the smaller stream valleys. It has a

wide distribution, areas of it occurring in many parts of the county. The material in the lower part of the subsoil effervesces with acid.

This land seems best suited for small grains and grass. It has been used to some extent for apple orchards, but results have not been satisfactory. Owing to its heavy texture, it is difficult to cultivate and only moderately productive. The pH values are as follows: 0 to 8 inches, pH 6.3; 8 to 14 inches, pH 7.5; and below a depth of 3 feet, the material effervesces when tested with hydrochloric acid.

Areas of Schoharie silty clay loam lie along the Parma Center road southwest of Hilton. An area is north of Genesee Junction, and several bodies lie north of Mendon and east of Honeoye Falls in the southeastern part of the county. A large area is occupied by the Rochester municipal airport, and other bodies lie along the Paul road to the west. Large areas are northwest of Henrietta.

Schoharie silt loam.—Schoharie silt loam differs from Schoharie silty clay loam principally in the more silty texture and friable consistence of the surface soil. The gray mottled layer is also less developed, and the brown layer is slightly thicker. This soil occurs in association with the silty clay loam and as a whole is a better soil, owing, primarily, to better drainage and friability of the silt loam. The textural and drainage differences make this an easier soil to handle than the silty clay loam, and it is therefore used for a wider range of crops. It is used mainly for wheat and other small grains and as grassland.

Areas of this soil are in Sweden and Ogden Towns in the southwestern part of the county.

Schoharie gravelly silt loam.—The 8-inch surface layer of Schoharie gravelly silt loam consists of reddish-brown gravelly silt loam. This grades into light grayish-brown gravelly silty soil mottled with rusty brown and extending to a depth of 10 or 12 inches. Below this is dull Indian-red silty clay loam which, in roadside cuts and gully banks, breaks into hard irregular clods ranging from one-half to 1 inch in diameter in the upper part of the layer but becoming larger and more regular in shape in the lower part. Below a depth of about 36 inches, the cloddy structure is less pronounced. The substratum consists of alternating layers of red clay and sandier material.

This soil has a level or nearly level relief, and in places it occupies high terraces above some of the small stream valleys. The gravel seems to be mixed through the surface soil and subsoil and to be of the same origin as that in the Dunkirk soils. In most places it is not sufficiently abundant to seriously affect cultivation or the productivity of the soil.

This soil is best suited for grassland and small-grain crops, but it is used to some extent for cabbage, beans, tomatoes, and other truck crops. It is not so well suited for apple orchards, as some of the better drained soils close to Lake Ontario, although it is used for this purpose with fair success.

Several bodies of this soil are in Brighton Town south of Rochester.

Schoharie clay loam, broken phase.—Schoharie clay loam, broken phase, is typical of the other soils of the Schoharie series, but it

occupies slopes so steep and gullied that it has no value as tillable land. Other than its slight use as grassland, it has little value except for wood lots or for forest land. The principal areas of this broken soil lie east of Honeoye Falls.

Schoharie fine sandy loam.—In an area along the Ireland road south of Walker, Schoharie fine sandy loam shows the following profile: The surface layer is dark-brown or slightly reddish brown light fine sandy loam which is finely granular and filled with grass roots. Below this is reddish-brown fine sandy loam of massive structure but crumbling easily. The pH value is 6.3. This material is underlain, at a depth of 12 inches, by light yellowish-brown and rusty-brown mixed and somewhat mottled fine sandy loam. It is thinly laminated and contains some small soft concretions of a rusty-brown color. The pH value is 7. At a depth of about 17 inches, this layer is underlain by dull Indian-red or dull reddish-brown compact silt with gray and rusty-brown mottlings, or it grades into dull-red clay which breaks into large blocky clods. The depth and character of the subsoil are variable. The material ranges from sandy loam to sandy clay.

This soil is closely associated with the heavier soils of the Schoharie series and has a rather low agricultural value. It is used principally for small grains and as grassland.

Fulton silt loam.—The 6-inch surface soil of Fulton silt loam is dark grayish-brown rather heavy but friable silt loam. Below this, and extending to a depth of 20 inches, is lighter, more grayish, brown silt loam mottled and streaked in the lower part with yellowish brown and rusty brown. This layer is underlain by an olive-gray heavy plastic silty clay loam or silty clay layer which is thinly stratified. On drying or where exposed to weathering, the material breaks into hard somewhat regular clods ranging from 1 to 3 inches in diameter. The material is highly calcareous.

Surface drainage of much of this soil is not good and, owing to the heavy subsoil, underdrainage is very poor. Where well drained and properly handled, the soil is productive and may be used for clover and alfalfa. It is also used for corn, wheat, and oats, good yields of which are obtained. Some areas are used for apple orchards.

The principal areas lie a short distance south of the ridge in the eastern part of the county.

Fulton silty clay loam.—Fulton silty clay loam has about the same arrangement of layers as Fulton silt loam, but the surface soil is slightly darker. Its slightly heavier texture tends to make it more refractory and difficult to cultivate. Crop adaptation is about the same. Only a few small bodies, closely associated with Fulton silt loam, are mapped.

The 7- or 8-inch surface soil consists of dark-gray, almost black when wet, silty clay loam. Below this is lighter, more grayish, brown silty clay loam mottled and streaked in the lower part with yellowish brown and rusty brown. This layer extends to a depth of about 20 inches and is underlain by olive-gray heavy plastic silty clay loam or silty clay, which is thinly stratified. On drying or where exposed to weathering, this material breaks into hard some-

what regular clods ranging from 1 inch to 3 inches in diameter. The heavy subsoil is highly calcareous.

This soil occupies flat and in places depressed or basinlike areas, and surface drainage is not good. On account of the impervious subsoil, underdrainage is poor. If it were well drained, this would be a highly productive soil well suited for clover, alfalfa, small grains, and corn.

Arkport very fine sandy loam.—Arkport very fine sandy loam consists of brown or light-brown loamy very fine sand which is slightly lighter brown below a depth of 8 inches. At a depth of about 20 inches, thin hard layers of sandy clay occur, which are of uneven thickness and in places tilted and bent or cross-bedded, with loamy sand between them. Below a depth of about 36 inches, the sandy clay layers are lacking and the loamy sand is lighter in color and highly calcareous. The surface soil is slightly or moderately alkaline. The relief is rolling or hummocky, which, together with the character of the soil material, affords good drainage.

This soil, if properly fertilized, is well suited for garden and truck crops and for small fruits, and it may be profitably used for other crops. The principal areas are in the vicinity of East Rochester, and several small bodies are south and west of Bushnell Basin. The land supports fair pasture, in which bluegrass predominates in many places.

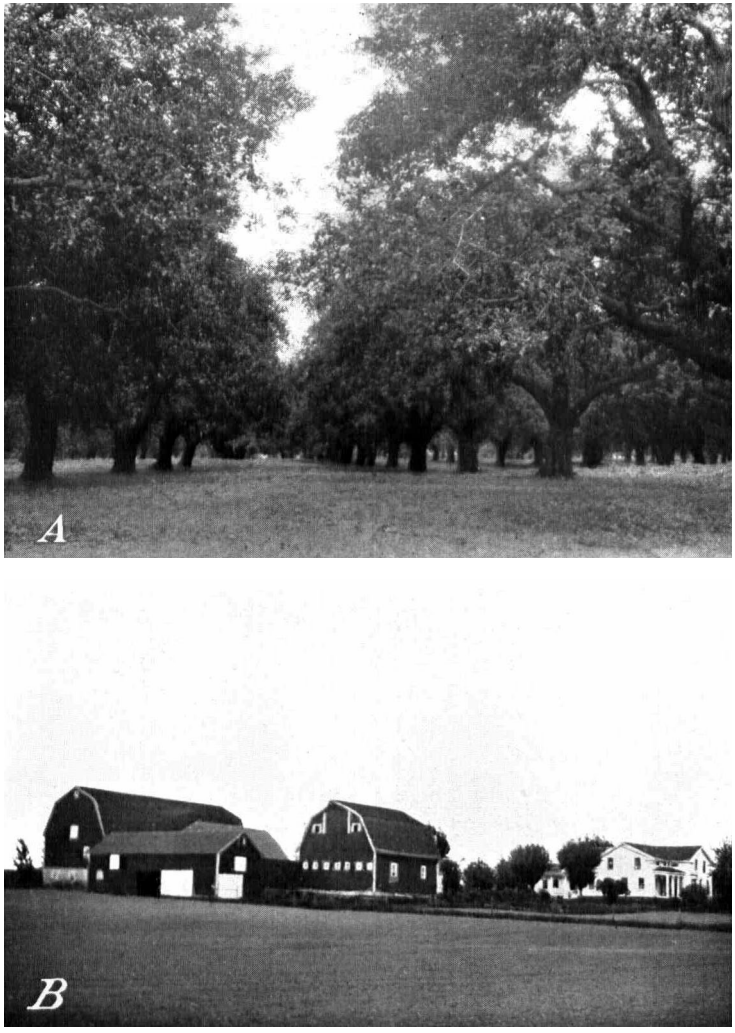
Arkport very fine sandy loam, broken phase.—The broken phase of Arkport very fine sandy loam differs from the typical soil principally in that it occurs in rough broken areas, in which the subsoil and substratum are exposed on slopes, leaving very small patches of surface soil on the crests of narrow ridges. Soil of this phase, on account of the steepness of the slopes and heavy erosion, is nontillable and of but low agricultural value. The land affords some pasturage, but it is best suited for forestry.

This soil extends as a border along the valley of Irondequoit Creek and along Irondequoit Bay.

Ottawa loamy fine sand.—The surface soil of Ottawa loamy fine sand consists of brown or light-brown loamy fine sand which is underlain at a depth of about 8 inches by lighter brown loamy fine sand or light fine sandy loam. This layer contains sufficient silt and clay to make the material slightly sticky when moist and to stand up in roadside cuts when dry, but it is free, or nearly so, of thin layers and lenses of sandy clay. The material in the lower subsoil layer, below a depth of 30 inches, is slightly lighter brown or grayish brown, is loose, and in places is incoherent. This soil has a small-hill or undulating relief and in places seems to have been influenced by wind-blown material. Drainage is inclined to be excessive. Natural productivity is rather low. The land is used to some extent for gardens and orchards.

This soil is widely distributed through the southeastern part of the county. A rather large area lies along the Pittsford-Victor road. Several bodies are south of East Rochester, and a few small areas are in the vicinity of Mendon.

A rolling phase of this soil occupies a fair-sized area north of Chili Center. Many small bodies lie along the outer edge of Genesee



A, A typical old orchard in the lake-shore district of western New York, *B*, typical farmstead on Dunkirk silt loam.

A, Profile of Poygan silty clay loam *B*, profile of Colwood loam

Valley from Westfall Station southward, an area is southwest of Ogden Center, and several bodies lie east and southeast of Hinkleyville.

Ottawa loamy fine sand, rolling phase.—The rolling phase of Ottawa loamy fine sand differs from the typical soil in having a more undulating and, in places, a dunelike relief and a somewhat looser incoherent structure. The hilly relief is owing, in large part, to wind action, and in places in cultivated fields the surface soil is subject to shifting by the wind. For this reason the land has a lower agricultural value than typical Ottawa loamy fine sand.

Ottawa loamy fine sand, mottled-subsoil phase.—The surface soil of Ottawa loamy fine sand, mottled-subsoil phase, consists of brown loose loamy fine sand grading below a depth of 8 or 10 inches into lighter brown loamy fine sand or light fine sandy loam. This layer contains enough silt and clay to make it slightly sticky when moist and to cause it to stand up in roadside cuts and gully banks when dry, but it is free or nearly so, of thin layers or lenses of sandy clay. Below a depth of about 30 inches are mottlings or spots of light gray, yellow, and rusty brown, similar to those in the Berrien soils. Soil of this phase probably holds moisture somewhat better than the typical soil, and for this reason it may be slightly more productive. It is used to some extent for gardens and orchards, but its natural productivity is low.

Ottawa loamy fine sand, broken phase.—The broken phase of Ottawa loamy fine sand bears the same relation to typical Ottawa loamy fine sand that the broken phase of Arkport very fine sandy loam bears to the typical Arkport soil. It occupies rough broken areas and steep eroded slopes, is not tillable, and is of very low agricultural value. It affords some pasturage but can best be utilized for forestry.

Petoskey loamy fine sand.—The 8-inch surface soil of Petoskey loamy fine sand consists of brown or light-brown loamy fine sand. This is underlain by slightly lighter brown loamy fine sand which becomes somewhat more compact with increasing depth, so that it stands up in ditch banks. It breaks into large clods which crumble easily. Below a depth of 3 feet the lower part of the subsoil shows a gray cast and is less coherent. This soil effervesces with acid from near the surface downward. In places the subsoil contains thin irregular layers of reddish-brown hard sandy clay, which are slightly cemented and are much like those occurring in the Arkport soils.

This soil has nearly level, smooth relief. It is used for truck crops, grapes, peaches, and to some extent for apples. On account of its very sandy texture and loose consistence, it is a soil of rather low productivity. It is developed principally along the eastern side of Irondequoit Bay and between Rochester and the lake shore on both sides of Genesee River.

Petoskey loamy fine sand, rolling phase.—The rolling phase of Petoskey loamy fine sand differs from the typical soil in that it has a more uneven relief, in which small hill areas are interspersed with nearly level areas. On the small hills the soils are looser, less coherent, and also less productive than in the more nearly level parts of the county. This rolling soil has a lower agricultural value than the typical soil.

This soil, to a depth of about 8 or 10 inches, consists of brown or light-brown loose loamy fine sand. It grades into slightly lighter brown loamy fine sand which becomes somewhat more compact with depth. It stands up well in roadside cuts. This material breaks into large clods which crumble easily. Below an average depth of about 3 feet the soil has a gray cast and becomes looser and less coherent. The surface soil is acid, but the slightly gray lower subsoil layer effervesces with acid.

This rolling land lies north of Rochester between Irondequoit Bay and Genesee River. Some areas are west of Genesee River.

Petoskey loamy fine sand, dune phase.—Almost the entire surface of areas of the dune phase of Petoskey loamy fine sand is covered by small mounds or dunes of loose incoherent fine sand. The land, however, supports a growth of grass and weeds sufficient to prevent serious shifting of the sand. It is used to only a very small extent for agriculture. In places it has been planted to orchards and vineyards, but these have proved unprofitable.

Petoskey loamy fine sand, steep phase.—The steep slopes bordering Irondequoit Bay, the lower valley of Genesee River, and the smaller streams in this part of the county are mapped as a steep phase of Petoskey loamy fine sand, although, in places, areas of water-worn gravel and of till have been included. These slopes are nontillable and can be used most profitably as forest land.

BROWN AND GRAYISH-BROWN SOILS CONTAINING WATER-WORN GRAVEL AND UNDERLAIN BY BEDS OF SAND AND GRAVEL

Soils of the Alton series are characterized by brown sandy surface soils containing water-worn gravel, lighter brown gravelly upper subsoil layers, usually heavier in texture than the surface soil, and stratified lower subsoil layers of sand and water-worn gravel. The surface soils and upper subsoil layers are neutral or slightly acid, and the lower subsoil layers are alkaline, effervescing freely at a depth of about 30 inches below the surface.

The Palmyra soils are grayish-brown, brown, or slightly reddish brown soils containing water-worn gravel and underlain by layers of water-worn gravel and sand. They are neutral or slightly calcareous in the surface soils and upper subsoil layers and highly calcareous below an average depth of about 18 inches, the layers of water-worn gravel in many places being embedded in and slightly cemented with carbonate of lime. These soils have developed on old glacial terraces and outwash plains. They differ from soils of the Alton series principally in that they are more highly calcareous in both surface soils and subsoils.

Soils of the Groton series closely resemble those of the Palmyra series, having about the same color at the surface, an abundance of water-worn gravel in both surface soils and subsoils, and in being highly calcareous at a slight depth. They differ from the Palmyra soils principally in that they have more yellowish brown subsoils, more cross bedding and tilting of the substrata, and occur in places where the relief is of the kame type, with numerous steep slopes subject to rapid erosion.

Alton gravelly fine sandy loam.—The 6-inch surface layer of Alton gravelly fine sandy loam consists of brown or dark grayish-

brown fine sandy loam containing various quantities of water-worn gravel. Below this is lighter or more yellowish brown sandy loam which is slightly compact and also contains water-worn gravel and coarse sand. Below a depth of 16 inches and continuing to a depth of about 30 inches are alternating layers of yellowish-brown sand, small sharp gravel, and small water-worn gravel, and below this are layers of water-worn gravel stratified and cross-bedded with thin layers of fine sand and small gravel.

The surface soil is slightly acid, the upper part of the subsoil about neutral, and the lower part of the subsoil, below an average depth of about 30 inches, strongly alkaline, effervescing freely with acid. Small masses of sand and gravel cemented with lime are common in the lower part of the subsoil, but in no place does the cemented material form a continuous hardpan over any considerable area.

This soil is extensively developed on the smoother higher parts of the ridge, on the slopes of hills near Spencerport in the western part of the county, and in a few other places. It is rather variable, especially on those slopes where it thins out and is underlain by other soils. On account of its good surface drainage and well-drained subsoil, it is well suited to tree fruits, small fruits, and gardens. It is used a little for the ordinary crops of this section, and yields are not high unless the land is well fertilized.

A large part of this soil is occupied by the road which follows the crest of the ridge, by villages, and by building sites for farm homes.

Alton coarse sandy loam.—Alton coarse sandy loam differs from Alton gravelly fine sandy loam principally in its coarser texture which is caused by the content of coarse sand and small sharp gravel. The soil also contains some water-worn gravel on the surface and through the surface soil and subsoil. It occurs in places along the ridge, in association with Alton gravelly fine sandy loam, and occupies the principal part of the low ridge a mile south of Troutburg in the northwestern part of the county. Here it is used almost entirely for orchards, a considerable part of the land being planted to peaches and some to cherries and grapes.

Where this soil is exposed in a gravel pit on the north side of Morton Knoll the following profile may be seen: The surface layer is dark-brown medium or coarse loamy sand containing from 10 to 20 percent of small water-worn gravel. It has a pH value of 7. Below a depth of 4 inches this material grades into slightly lighter brown loamy medium or coarse sand or light sandy loam. The structure is massive, but the material crumbles easily. Plant roots are abundant. The pH value here is 7.3. Below a depth of 15 inches is yellowish-brown loamy medium sand containing a few small water-worn gravel. Thin layers of more compact slightly redder and heavier soil may occur within this layer. Below a depth of 30 inches is a more grayish brown thinly stratified medium or coarse loamy sand containing gravel slightly cemented in places in the lower part of the profile.

Alton coarse sandy loam, light-textured phase.—The light-textured phase of Alton coarse sandy loam, to a depth of about 5 inches, consists of dark-brown medium or coarse loamy sand con-

taining from 10 to 20 percent of small water-worn gravel. Below this and extending to a depth of 30 inches is more yellowish brown soil of about the same texture and containing about the same quantity of gravel. In places below this depth is a layer of grayish-brown sand nearly free from gravel, and in other places is a thin layer of coarse water-worn gravel. This soil is used for peaches, grapes, and other crops but seems less well suited for these crops than the soils of finer texture. The principal areas lie north of the ridge a short distance east of Irondequoit Bay.

Alton loamy sand.—Alton loamy sand differs from Alton gravelly fine sandy loam principally in being slightly lighter and more sandy in texture. The sand as a whole is somewhat coarser, and the soil contains less water-worn gravel. The land has about the same crop adaptation as Alton gravelly fine sandy loam, accompanied with lower yields.

Palmyra gravelly loam.—The 8-inch surface soil of Palmyra gravelly loam consists of dark grayish-brown or slightly reddish brown light gravelly loam, in which the gravel are small and water-worn. Below this and extending to a depth of about 18 inches is the slightly more reddish brown very gravelly and slightly compact subsoil. This is underlain, at a depth of about 24 inches, by very gravelly loam, in which the rounded gravel are coated with lime on the lower side. Between depths of 30 and 60 inches is gray calcareous gravel with bands and streaks of lime accumulation, the gravel below a depth of 60 inches being, in many places, well cemented.

This soil, in general, occupies broad nearly level areas, is highly productive, and is adapted to a wide range of crops, especially clover and alfalfa.

This soil occurs principally in the southern part of the county. An area is about 3 miles northwest of Mumford, and three are northeast of the same town. Several areas are east of Rush, and one is west of Scottsville.

Practically all the land is under cultivation and highly developed. It is adapted both to the general and the intensively farmed crops of this section. The surface soil contains a moderate amount of organic matter, its gravel content in few places is sufficient to interfere with tillage, and the land may be worked under a fairly wide range of moisture conditions. Considering the open porous character of the lower subsoil layer, the soil holds moisture well. A larger acreage is in grass—timothy and clover—than in any other crop. Wheat is the leading grain crop, and oats rank second. Corn is grown for grain and for silage. Beans are a favorite crop. Potatoes are widely planted, mostly in small tracts of a few acres each. The minor crops are cabbage, tomatoes, canning-factory crops, orchard fruits, and small fruits. Dairying is an important industry on some farms and a side line on others.

Crop yields on Palmyra gravelly loam equal or exceed the average for the county. Hay commonly yields from 1½ to 2½ tons an acre; corn, 35 to 75 bushels; wheat, 15 to 30 bushels; oats, 25 to 65 bushels; potatoes, 100 to 200 bushels; beans, 10 to 20 bushels; and cabbage, 8 to 12 tons.

Palmyra gravelly loam, heavy phase.—The heavy phase of Palmyra gravelly loam consists of dark-gray or dark grayish-brown heavy loam or silt loam to a depth of about 8 inches. It contains a moderate amount of small water-worn gravel. Below this, and extending to a depth ranging from about 18 to 24 inches, is slightly reddish brown very gravelly heavy loam. At an average depth of about 24 inches this is underlain by very gravelly loam, in which the small rounded gravel are coated with lime, especially on the lower sides. Between depths of 30 and 60 inches is gray calcareous gravel with bands and streaks of lime accumulation, the gravel in places being well cemented.

This soil is slightly heavier than the typical soil, is more difficult to handle, and also, possibly, is slightly more productive for small grains and hay. It is well suited to clover, alfalfa, corn, wheat, oats, and cabbage. Owing to its high lime content it is not a good soil for potatoes.

This soil is closely associated with typical Palmyra gravelly loam and, as a rule, occupies the flatter less well drained areas.

Palmyra gravelly loam, broken phase.—Palmyra gravelly loam, broken phase, occupies steep broken and eroded slopes. Except as grassland, it has little agricultural value. This phase is closely associated with the typical soil.

Palmyra gravelly fine sandy loam.—The 5-inch surface layer of Palmyra gravelly fine sandy loam consists of dark-brown or dark grayish-brown loamy fine sand. It is underlain by slightly lighter brown fine sandy loam which crumbles easily into small clods ranging from one-half to 1 inch in diameter. Below a depth of 12 inches is yellowish-brown fine sandy loam of slightly coarser texture, containing some gravel; below a depth of 30 inches is brown or light-brown gravelly coarse sandy loam, the gravel being small and water-worn; and below a depth of 48 inches are layers of sand and gravel, the gravel being small, water-worn, and in places lightly cemented.

The surface soil is about neutral, and the subsoil effervesces freely with acid. This soil has about the same crop range as Palmyra gravelly loam, but without amendments the yields are slightly lower.

Several areas of Palmyra gravelly fine sandy loam occur east of Mumford, west of Mendon, south of Mendon Center, and north and east of Sibleyville.

Groton gravelly loam.—Groton gravelly loam consists of brown or dark yellowish-brown gravelly loam to a depth of about 8 inches. The gravel are small, abundant, and water-worn. Below this and extending to a depth of about 18 inches, is yellowish-brown not compact gravelly sandy loam, and below this is gray calcareous gravelly sand which is stratified and cross-bedded with layers of water-worn gravel The accumulation of lime in masses and cemented layers is less pronounced than in the Palmyra soils. Much of this soil occupies steep slopes, and the most extensive area is northeast of Rush. Other areas are in the vicinity of Mendon Ponds. Smaller bodies occur in other parts of the county. Many of the numerous gravel pits are on Groton soils.

On account of the steep slopes and droughty character, yields are much lower than on the Palmyra soils.

Groton gravelly fine sandy loam.—The 8-inch surface soil of Groton gravelly fine sandy loam consists of brown or dark yellowish-brown gravelly fine sandy loam, in which the gravel are small and water-worn. Below this and extending to a depth of about 18 inches is yellowish-brown loose gravelly fine sandy loam. This rests on beds of gray calcareous gravelly material, the beds consisting of assorted gravel and sand, tilted and cross-bedded. The accumulation of lime in masses and cemented layers is less pronounced than in the Palmyra soils. Much of this soil occupies such steep slopes that the surface soil is constantly removed by erosion.

The principal areas of this soil are in the vicinity of Mendon Ponds and south of Fairport. Many small bodies are in the vicinity of Spencerport.

Production of crops is low. This soil is best suited for grassland and forest.

Groton loamy sand.—Groton loamy sand consists of brown loose loamy sand to a depth of about 8 inches, below which is yellowish-brown loamy sand containing some water-worn gravel. The subsoil consists of calcareous sand and gravel. The land has a low agricultural value. It is best suited for grassland and forest.

DARK-BROWN, BROWN, AND DULL-RED SOILS, SHALLOW OVER ROCK

This group includes those dark-brown, brown, and dull-red soils, in which the partly disintegrated rock beds lie at comparatively slight depths.

The surface soils of members of the Lockport series are dark brown or nearly black, passing into dull reddish-brown or dull-red heavy clay subsoils. These are underlain, at a depth of about 2 feet, by dull-red Medina and Queenstown shale and sandstone.

The Brockport soils have dark-gray surface soils which are lighter in color below a depth ranging from 5 to 8 inches, and dull-gray or slightly olive gray heavy subsoils which break into hard somewhat rectangular clods and are underlain, at a depth of about 20 inches, by partly disintegrated thin-bedded shale and this at a slight depth by limy shale and limestone. These soils, as a rule, are heavy and refractory and have very poor underdrainage.

Soils of the Farmington series are brown, dark brown, or reddish brown; are, as a rule, stony or gravelly; and are underlain at comparatively slight depths by rock beds consisting largely of limestone.

The Riga soils are grayish-brown silty soils, in which are numerous fragments of greenish-gray or brown hard shale. They are underlain by slightly weathered shale at a depth of about 3 feet. The surface soils are acid, and the lower subsoil layers are slightly alkaline. In places, these soils have been modified by thin deposits of till.

Lockport silty clay loam.—The 7-inch surface layer of Lockport silty clay loam consists of dark-brown or slightly reddish brown silty clay loam. In old uncultivated fields or in wood lots, the material is fine and granular, the small masses being about the size of grains of wheat. This dark-colored layer is underlain by a thin light-gray silty layer, mottled with rusty brown in the lower part, which extends to a depth of 10 or more inches. This layer, in turn, is underlain by dull reddish-brown clay which breaks into hard irregular sharp clods, ranging from one-half to 1½ inches in

diameter, and extends to a depth of about 30 inches. Below this is dark chocolate-brown or reddish-brown partly disintegrated shale. In places near the top of the shale is a thin layer of olive-green sandy shale. The surface soil is acid, but the substratum is alkaline and in places effervesces slightly with acid.

This soil is flat and is poorly drained on the surface, and underdrainage is very poor. It covers a rather large area immediately north of the ridge in the western part of the county and is used largely for pasture land. It has a low value for cultivated crops and is unsuited for orchard planting. The native forest growth consists largely of hickory, swamp white oak, and elm. The pasture grasses are Canada bluegrass and creeping bentgrass. Spots of sedges and rushes are common.

Lockport silty clay loam, brown phase.—The surface soil of the brown phase of Lockport silty clay loam is dark, slightly reddish, brown, and granular to a depth of about 5 inches, beneath which is light reddish-brown or grayish-brown silt loam, containing light-colored spots but no distinct mottling, extending to a depth of about 12 inches. Below this is the dull-red cloddy clay and partly disintegrated substratum similar to that underlying the typical soil.

Soil of this phase is closely associated with typical Lockport silty clay loam. It occupies slightly higher better drained areas. It is used to some extent for corn, cabbage, and tomatoes, also as hay and pasture land. Yields of all crops are low.

Soil of this phase lies slightly higher than the surrounding soils and has better surface drainage. It is used for small grains and to some extent for intertilled crops but is not highly productive.

Brockport silt loam.—Brockport silt loam consists of dark-brown or dark grayish-brown granular silt loam to a depth of about 5 inches. This material is underlain by a lighter brown or pale-yellow slightly mottled layer about 3 inches thick. Below this, and extending to a depth of about 18 inches, is dull-gray or slightly olive gray clay which, on exposure and weathering, breaks into hard rectangular clods ranging from 1 to 2 inches in diameter; and below this is dull-gray thin-bedded partly disintegrated shale, with beds of harder shale and thin beds of limestone in the deeper substratum. The surface soil is slightly acid or neutral, and the subsoil effervesces freely below a depth of 18 inches.

This soil occupies a narrow belt extending east and west to the south of Brockport and fair-sized areas near North Gates. The relief is somewhat hilly.

The soil is used for field crops, for alfalfa, and to some extent for apple and pear orchards, but it is heavy, refractory, and only moderately productive, except for pasture grasses. The pastures consist mainly of bluegrass and may be considered better than the average for this county.

Brockport gravelly loam.—Brockport gravelly loam is a shallow soil more or less residual and weathered from gray or yellowish-gray soft highly calcareous shales. In places there is a thin coating of glacial material derived from red sandstone, shales, and limestone. In such places the surface soils developed from the glacial drift are browner and better oxidized. They also contain more gravel and stone than those developed from purely residuals which contain little or no stone or gravel.

The relief ranges from smoothly sloping to gently undulating, and drainage is not perfectly established, owing to the heavy subsoil and substratum. Poorly drained areas have prevailingly dark heavy-textured surface soils and gray subsoils.

Practically all the land is cleared and utilized for crops grown in connection with dairying. Beans, cabbage, tomatoes, and fruit also are produced.

Farmington loam.—The topmost layer of Farmington loam consists of dark-brown finely granular loam grading below a depth of 2 inches into slightly coarser granular loam or silt loam. At a depth of about 6 inches this is underlain by light-brown or yellowish-brown soil of heavier texture, which breaks into irregular hard clods ranging from one-half to 1 inch in diameter. At a depth of about 12 inches this material grades into reddish-brown clay loam which has a massive structure and breaks into large irregular clods. In places it is spongelike or porous. Below a depth ranging from about 24 to 30 inches, light-brown fine-grained soft limestone is present.

This soil occurs in rolling or hilly areas. Large dolomite boulders and erratics are common in places. The soil is used for the common farm crops of the county and for pasture land, and, where of good depth, it is fairly productive. Pasture is good, except in dry seasons, when it deteriorates very rapidly.

Farmington cherty loam.—To a depth of 5 inches, Farmington cherty loam consists of dark-brown or nearly black loam in which are many small sharp chert gravel. Below this depth, the color is lighter brown and the material is cherty loam, the chert fragments being very abundant below a depth of 12 inches. The cherty limestone bed is reached at a depth ranging from 12 to 18 inches.

This soil is used for small grains, beans, clover, and pasture grasses, but, owing to its shallowness and large content of gravel, it is of low value.

Farmington stony loam.—Farmington stony loam represents areas of Farmington soils which include large outcrops of limestone and dolomite, making the soil nearly nontillable but of some use for pasture land, wood lots, and forest. This and all other Farmington soils occur principally in the south-central part of the county, in the vicinity of Honeoye Falls.

The surface soil consists of light-brown, slightly reddish brown, or dark-brown stony or gravelly loam. The finer soil material is loam or silt loam and is friable and mellow. Scattered over the surface and mixed with the soil are many rock fragments, principally of limestone. When dry the surface soil is grayish brown. The subsoil, which lies at a depth ranging from 8 to about 15 inches, consists of lighter brown, slightly reddish brown, or yellowish-brown compact but friable loam or silt loam, containing a variable quantity of stones. The subsoil is underlain by limestone. Outcrops of rock are common, and in many places the bedrock lies only a few inches below the surface. The limestone contains considerable chert. The source of parent material is principally the underlying limestone with a thin covering of glacial till and shale.

This soil occurs in comparatively smooth areas and along steep breaks or limestone escarpments. Drainage ranges from fair to good, and the land is inclined to be droughty.

Only about 5 or 10 percent of this land is under cultivation, but a considerable part is used for pasture. The larger part supports a growth of oak, hickory, and elm trees. Some grain and hay crops are grown, but yields are light.

Farmington gravelly loam.—The surface soil of Farmington gravelly loam consists of dark-brown or dark reddish-brown fine-granular gravelly loam with an abundance of limestone fragments on the surface and through the soil. Below a depth of 2 or 3 inches the color is more reddish brown. The subsoil becomes more stony with increasing depth, and limestone beds occur at a depth of 30 inches or less. This soil is variable both in depth to bedrock and in content of gravel. It is highly calcareous from a point near the surface downward. It is used for grass, small grains, beans, clover, and alfalfa. Yields are medium.

Farmington sandy loam.—To a depth of 6 inches Farmington sandy loam consists of dark-brown gravelly sandy loam. This grades into light-brown or yellowish-brown sandy loam of heavier texture, which breaks into irregular clods that may be easily crumbled. At a depth of about 12 inches, this material grades into reddish-brown loam of massive structure. Below a depth of about 30 inches this material, in turn, is underlain by light-brown fine-grained soft limestone.

This soil differs from Farmington gravelly loam principally in its more sandy texture, the smaller content of gravel, and its slightly greater thickness.

The land is used for grass, small grains, beans, clover, and alfalfa. Yields range from medium to low.

Riga silt loam.—Riga silt loam consists of grayish-brown granular silt loam to a depth of about 6 inches, where it is underlain by lighter gray heavier silt loam which breaks into small sharp clods. At a depth of about 15 inches, this layer is underlain by darker gray heavier soil, in which are numerous fragments of thin hard shale. Below a depth of 24 inches, this material, in turn, grades into partly disintegrated greenish-brown shale which overlies unweathered shale at a depth of about 30 inches. The surface soil and upper subsoil layer are slightly acid, but below a depth of 24 inches the material effervesces slightly with acid. In places, areas in which a gray mottled layer has been moderately developed are included in mapping.

This soil has a rather low agricultural value. Corn yields from 20 to 35 bushels an acre; wheat, 10 to 25 bushels; oats, 15 to 40 bushels; beans, 10 to 15 bushels; and cabbage, 7 to 15 bushels. The land is used largely as hay and pasture land.

The principal area of this soil lies south of Riga Center.

Riga silt loam, gravelly phase.—The gravelly phase of Riga silt loam to a depth of 6 inches is grayish-brown gravelly silt loam, the gravel consisting of thin fragments of greenish-gray shale. This layer is underlain by lighter gray heavier silt loam which contains a larger proportion of the greenish-gray shale and when disturbed breaks into small sharp hard clods. Below a depth ranging from 18 to 24 inches this is underlain by partly weathered shale which grades below a depth of 30 inches into rather hard unweathered

shale. In places it contains other gravelly material and has a more reddish brown color, probably owing to the thin deposit of till.

The relief is undulating or slightly hilly. The principal crops are corn, small grains, and grasses for hay and pasture. Yields are slightly lower than on the typical soil. The soil is used largely as grassland.

DARK-GRAY, BROWN, DARK-BROWN, AND REDDISH-BROWN SOILS DEVELOPED FROM ALLUVIUM

Group 5 includes dark-gray, brown, dark-brown, or reddish-brown soils deposited in stream valleys and subject to frequent or occasional overflow. Both surface soils and subsoils are stratified, owing to their mode of deposition and not to weathering processes.

Soils of the Genesee series have brown or dark grayish-brown surface soils and lighter brown subsoils. They are free or nearly free from mottling in the lower part of the subsoil. They occur in the flood plains of the larger streams and are subject to frequent or occasional deposition of alluvial material.

The Tonawanda soils are dark gray or dark grayish brown, have a well-developed gray and mottled layer, and a heavy compact lower subsoil layer. They occupy the higher parts of the stream flood plains and are subject to overflow only during periods of unusually high water.

Soils of the Hamlin series are reddish brown or dull red, have no gray or mottled layer in the upper subsoil layer, and no compaction of the material in the lower part of the subsoil due to weathering. They occupy the flood plains of some of the smaller streams, especially those which drain the reddish-brown soils of the northern part of the county.

The Eel soils are dark grayish-brown or reddish-brown soils occurring in small stream flood plains. They have a well-developed gray and mottled layer, owing to lack of drainage rather than to a compact layer like that of the Tonawanda soils.

Genesee silt loam.—To a depth of about 10 or 12 inches, Genesee silt loam consists of brown or dark-brown friable silt loam. Below this is lighter brown or yellowish-brown slightly heavier and more compact silt loam extending to a depth of 30 or more inches, in places to a depth of many feet. In some places there is gravel in the surface soil and sand and gravel in the deep subsoil. The principal variations, however, are owing to drainage conditions. In the lower lying, less well drained areas, the surface soil is heavier and darker and the lower part of the subsoil contains some gray mottling, whereas in the higher lying positions the soil has been influenced to a greater extent by weathering and soil layers are more distinctly developed.

Genesee silt loam and its high phase are used for corn, small grains, and grasses, and, when not injured by overflow, crops return good yields. There is, however, a slight tendency for grains to lodge.

Areas of Genesee silt loam extend along Genesee River and in places along some of the other large streams. A broad area of this soil lies in the Genesee Valley east of Scottsville, and a body extends from near North Rush to the southern boundary of the county.

The relief is flat, and the land lies from 4 to 10 feet above the normal level of the streams. Drainage is adequate, except during periods of heavy rainfall and during infrequent periods of overflow.

The original heavy forest growth was removed in the early agricultural development of the county, as the productiveness of this soil was quickly recognized. At present only a few willows, elms, and sycamores grow along the stream channels. The soil is fairly well supplied with organic matter and is easily cultivated. It is practically all in cultivation to grass, corn, wheat, and oats, giving good yields of all crops. The overflow hazard is not great during the growing season.

Genesee silt loam, high phase.—Genesee silt loam, high phase, occurs at slightly higher elevations than the typical soil, in general along the outer edges of the valleys, is subject to less frequent overflow, and has a fairly well developed profile. In this phase the dark surface soil is not quite so deep as in the typical soil, the subsoil is more compact, and the gray mottling in the lower part of the subsoil is more pronounced.

Crop adaptations and yields are practically the same as on the silt loam, but this soil is less subject to overflows.

Genesee fine sandy loam.—Genesee fine sandy loam is brown or dark-brown friable fine sandy loam to a depth of about 8 inches, and below this it is slightly lighter brown fine sandy loam or loam, which is fairly compact. Below a depth of 30 inches the material is more friable and in places contains sand and gravel. In some places, where drainage is not good, the lower part of the subsoil is moderately mottled with yellow and rusty brown.

This soil occurs in the valley of Genesee River and in the valleys of some of the larger streams. Where not subject to too frequent overflow it is highly productive and is well suited for growing corn, grasses, clover, and small grains. Small grains, however, tend to grow too rank, producing straw rather than grain.

Genesee fine sandy loam, high phase.—The high phase of Genesee fine sandy loam lies at a slightly higher elevation than the typical soil, is overflowed less frequently, and has a more pronounced profile development. This soil shows some indication of a gray and mottled layer underlain by a rather compact upper subsoil layer. This soil and the high phase of Genesee silt loam are intermediate in stage of development between the Genesee and Tonawanda soils.

Tonawanda silt loam.—To a depth of 6 inches, Tonawanda silt loam, as developed in the valley of Genesee River in this county, consists of grayish-brown silt loam with an easily crumbled small-cloddy structure. Below this is light-gray silt loam containing stains of yellow and rusty brown, which increase downward to a depth of about 12 inches. Below this, and extending to a depth of about 30 inches, is yellowish-gray or olive-brown silt loam with large pronounced mottlings of rusty brown. This material is underlain by olive-brown and gray mottled very compact silty clay which is, in general, more friable below a depth of 3 feet and in places is underlain by silt loam or fine sandy loam.

This soil occupies the principal part of the broad valley of Genesee River from the Barge Canal southward almost to the southern boundary of the county. It lies at a slightly higher elevation than

the adjacent Genesee soils and is subject to overflow less frequently, hence it has reached a more advanced stage of development, has a more compact subsoil, and is more strongly acid.

It is used for corn, small grains, grass, and, if limed, may be used for clover. It is moderately productive.

Hamlin silt loam.—To a depth of about 15 inches, Hamlin silt loam consist of dark-brown or slightly reddish brown silt loam which is dull red when dry. The surface soil is very granular, and the small clods crumble readily. Below the 2- or 3-inch surface layer the material becomes more distinctly reddish brown, and the clods are slightly larger and harder. Below this depth, the material grades into slightly lighter red or salmon-colored sandy clay which, when dry, has a small irregular-clod structure. Very slight mottlings of rusty brown are present in the lower part of the layer. Below a depth of 24 inches is reddish-brown or Indian-red fine sandy loam of massive structure and containing slight rusty brown stains. The surface soil in most places is slightly acid, the pH value being about 6.5, and the subsoil is slightly alkaline, with a pH value of 7.5.

This soil is subject to frequent overflow and deposition and for this reason is used largely for grass and pasture land, although some of it is used for corn and other tilled crops.

It occurs in the flood plains of the small streams draining that part of the county north of the ridge west of Genesee River.

Hamlin fine sandy loam.—The topmost part of Hamlin fine sandy loam consists of dark reddish-brown fine sandy loam which is dull red when dry. The surface soil is granular, and the small clods crumble easily. Below the 2- or 3-inch surface layer the soil becomes more distinctly reddish brown, and below a depth of about 15 inches it grades into slightly lighter red or salmon-colored sandy loam or loam. Very slight mottlings of rusty brown are present in the lower part of this layer. Sand and gravel are reached in most places below a depth of 30 inches. In some places gravel is abundant in the surface soil and subsoil.

This soil is subject to frequent overflow, and the ground water may be reached at a slight depth.

The land is used principally as pasture. A few small areas, however, are used for garden plots and for corn.

Eel silt loam.—The 9-inch surface layer of Eel silt loam consists of dark grayish-brown or reddish-brown silt loam. It is underlain by slightly lighter brown silt loam, stained with yellow and brown in the lower part, which continues to a depth of about 20 inches. Below this is gray or grayish-brown silt loam strongly mottled with rusty brown and in places containing dark-brown concretions and soft concretionary material. The material in the lower part of the subsoil is variable, ranging from silt loam to sandy loam and gravelly loam. In many places the water table is reached at a depth ranging from 3 to 4 feet.

This is not an extensive soil. It is used largely for grass and pasture and to some extent for corn and other tilled crops.

Eel fine sandy loam.—Eel fine sandy loam differs from Eel silt loam principally in having a lighter, more sandy, texture. It is used in the same way but is less extensive.

It consists of dark grayish-brown fine sandy loam to a depth of about 9 inches where it is underlain by lighter grayish-brown fine sandy loam or silt loam, extending to a depth of about 20 inches. Below this is silt loam strongly mottled with gray and rusty brown. This is underlain at a depth of 30 inches or less by sand and gravel.

This soil in places has slightly better surface drainage than the silt loam, but the water table lies at a slight depth. It is used in the same way as Eel silt loam, principally as grassland, with a few areas devoted to corn and truck crops. It is closely associated with the silt loam in the valleys of small streams, principally north of the ridge.

DARK-GRAY AND NEARLY BLACK SOILS, OCCUPYING SMALL VALLEYS, BASINS, AND FLAT POORLY DRAINED AREAS

The Lyons soils have developed from nearly the same parent glacial till as the Ontario and Honeoye soils, but they are of less depth and are less well drained. They occupy flat and, in many places, imperfectly and poorly drained areas. They are dark grayish brown in the surface layer and are mottled light brown, gray, and rusty brown in the subsoil. The lower part of the subsoil consists of grayish-brown or light-gray loam, silt loam, or clay. Gravel on the surface and distributed through the surface soil and subsoil is common, and in places areas are thickly covered with large rocks, some of which are limestones of local origin, but many are erratics of various kinds.

Soils of the Westbury series have dark-gray or dark-brown gravelly surface soils, a lighter brown upper subsoil layer grading into a gray and rusty-brown mottled layer, beneath which is compact till. These soils are acid in both surface soil and subsoil, and in places the substratum also is acid to a depth ranging from 3 to 5 feet. They bear the same relation to the Worth soils that the Hilton soils bear to the Ontario soils.

Soils of the Poygan series differ from those of the Schoharie series in having a darker surface soil, a more strongly developed gray and mottled layer in the subsoil, and a more pronounced cloddy structure in the lower part of the subsoil. The Poygan soils have developed from nearly the same materials as the Schoharie soils but under conditions of imperfect drainage. In many places they are shallow, and the deep substratum consists of glacial till like that from which the Ontario soils have developed. Heavy soils predominate.

The Colwood series includes soils having dark-gray surface soils underlain, at a depth ranging from 7 to 15 inches, by light-gray or almost white material which is lighter in texture, stained and mottled in the lower part, and underlain by sandy clay, in places by gravel and sand, or by till. Both surface drainage and underdrainage are poor.

The Granby soils are very similar to the Colwood soils. They occur in broad flat areas rather than in narrow belts as do the Colwood soils.

Soils of the Toledo series are dark gray or nearly black in the surface layer, lighter gray with stains of yellowish brown below a depth of 10 inches, and at an average depth of about 24 inches are underlain by gray plastic clay or sandy clay mottled in the upper part. They occupy narrow poorly drained areas.

The Wayland soils have dark-brown or dark grayish-brown surface soils, lighter gray upper subsoil layers slightly mottled with yellowish brown, and slightly reddish brown or yellowish-brown light fine sandy loam lower subsoil layers. They occupy nearly level poorly drained areas and have developed largely from alluvial material. They occur mainly in the southeastern part of the county.

Lyons loam.—Lyons loam consists of dark-brown, dark grayish-brown, or almost black loam to a depth of about 8 inches. It is underlaid by pale-yellow or light-gray loam or silt loam, mottled in the lower part with yellow and rusty brown. Below a depth of about 30 inches the material is very gravelly and, in places, is stony till varying considerably in color, according to the parent material. The material in the lower part of the subsoil effervesces freely with acid.

This soil occurs in low poorly drained belts associated with the Ontario and Honeoye soils, and it is used almost entirely as grass and pasture land or for wood lots. It is most extensively developed in the eastern part of the county south of the ridge. Several small areas are east of Spencerport, and narrow belts occur in several places south of the ridge.

Lyons loam, gravelly phase.—The gravelly phase of Lyons loam, to a depth of about 5 inches, consists of dark-brown or nearly black fine sandy loam having a well-developed granular structure. Below this depth the material is lighter in color and is slightly mottled with rusty brown. Between depths of 7 and 15 inches it is purplish-brown gravelly loam with rusty-brown mottlings, which breaks into fairly hard clods ranging from one-fourth inch to 1½ inches in diameter. Between depths of 15 and 30 inches, the material is purplish-brown compact till including masses of sandy clay, and below a depth of 30 inches there are thin beds of fossiliferous limestone.

The surface soil is acid, the pH value being about 5.8, but at a depth of 15 inches the pH value is 7.

This soil occupies a broad, flat, not very well drained area north and northeast of Webster. It includes bodies which are slightly higher, better drained, and more reddish brown. Some bodies of this included soil are nearly free of gravel. In areas of this soil rock fences are numerous, the rocks consisting principally of reddish-brown fine-grained sandstone in thin slabs and also including rounded erratics of granite and quartz.

The land is used largely for corn, for truck crops, and for wood lots, and to a small extent for orchards.

Lyons silt loam.—Lyons silt loam differs from Lyons loam principally in texture. The 6-inch surface layer consists of dark-gray or dark grayish-brown silt loam, below which is light-gray silt, mottled with yellow and rusty brown in the lower part, extending to a depth of 18 inches. Below this depth, the material is heavier in texture and grades into gray, pink, and yellowish-brown silty clay extending to a depth of about 40 inches, where it is underlain by rock beds. The soil material effervesces freely with hydrochloric acid at a depth of 18 inches.

This soil occupies low-lying poorly drained positions and resembles soils of the Granby series. In places large limestone boulders and other stones are abundant on the surface.

North of the ridge in the vicinity of Webster, several areas are included with this soil in mapping, in which rock beds are reached at a slight depth, and here the soils closely resemble the Brockport soils. This soil is used largely as grassland, mainly for pasture.

Westbury loam.—Westbury loam consists of dark-brown friable gravelly loam to a depth of about 7 inches. Below this and extending to a depth of about 14 inches is light-brown gravelly loam of slightly lighter texture. This is underlain by light-gray and rusty-brown mottled gravelly loam which, in turn, is underlain at rather widely varying depths by a layer of compact till that is less compact below a depth of 3 feet. Both surface soil and subsoil are acid. This soil occupies nearly level areas where surface drainage is not good and underdrainage, owing to the compact layer of the deep subsoil, is imperfect.

A small area of this soil lies about 1 mile northwest of Five Points along the West Henrietta road, and one is near West Rush.

Westbury loam is used for most of the tilled crops of this section, in addition to small grains and grasses. It is not well suited to clover, alfalfa, or orchards. Yields are rather low.

Poygan silty clay loam.—The 5-inch surface layer of Poygan silty clay loam is dark grayish-brown heavy soil with a rather coarse granular structure. The color gradually becomes slightly lighter, light brown or light grayish brown, below this depth, and the texture is heavy silt loam or silty clay loam. The material contains rusty-brown stains which become more abundant in the lower part, where they form small brown spots, in places surrounding soft concretions. This layer breaks into sharp hard clods ranging from one-eighth to three-fourths inch in diameter. At a depth of about 13 inches, this material is underlain by dark-brown or slightly reddish brown compact clay which breaks into clods, with nearly smooth surfaces and a dark surface coating, ranging from 1 inch to 3 inches in diameter. In the lower part of this layer are spots of olive gray. This layer is underlain, at a depth of about 22 inches, by dull-brown or slightly olive brown clay containing nearly white and Indian-red streaks. The material shows a slight vertical cleavage. At a depth ranging from 30 to 36 inches is reddish-brown very compact sandy till. The surface soil is slightly acid, with a pH value of about 6, and the subsoil, at a depth of about 30 inches, effervesces freely with acid. Plate 2, *A* shows a profile of this soil.

North of the ridge this soil occurs in close association with the Hilton soils and in places seems to have developed from a thin deposit of water-laid material over till. It occupies flat poorly drained areas on the tops of ridges, also depressed and poorly drained areas, especially around the sources of small drainageways, within or at the edge of the till ridges. Here numerous small bodies surrounded by areas of other soils are planted to orchards, but on this soil the trees become unproductive prematurely and eventually die.

In other parts of the county the soil is associated with the Schoharie soils, occupying the lower less well drained parts of the areas. It is used principally as grassland and for small grain. It is difficult to cultivate and is not highly productive.

A small area of Poygan silty clay loam occurs south of Hilton at the junction of the Burritt and South Avenue roads, and other small

areas are in this part of the county. Small areas are associated with Schoharie silty clay loam around the Rochester municipal airport, southwest of Rochester.

Poygan silt loam.—Poygan silt loam is slightly lighter brown in the surface soil than Poygan silty clay loam, is lighter in texture, is more easily cultivated, and is somewhat better drained. It is used in about the same way as the silty clay loam—for grassland and for small grain—but is, as a whole, a little more productive. This soil is associated with Poygan silty clay loam southwest of Rochester. Several areas are southeast of Ogden Center.

Poygan fine sandy loam.—Poygan fine sandy loam consists of dark grayish-brown fine sandy loam to a depth of about 10 inches. This is underlain by dull-red silt loam, somewhat mottled with gray, which, in turn, is underlain, at a depth of about 18 inches, by dull-red silty clay continuing to a depth of 30 or more inches where it is underlain by a more sandy lower subsoil layer.

Poygan fine sandy loam is used principally as hay and pasture land, but it may be used for small grains and other cultivated crops. Although production is low, this soil is handled more easily than the other Poygan soils.

A few small areas lie south of Mortimer and west of Honeoye Falls.

Colwood loam.—Colwood loam consists of dark-gray or dark grayish-brown granular loam of fine light texture, to an average depth of about 10 inches, with a range from 7 to 15 inches. This material is very abruptly underlain by light-gray or nearly white soil of lighter texture—in places a fine sandy soil—which extends to an average depth of about 18 inches but ranges widely in thickness. The upper limit of this layer is sharply defined, but the lower limit is rather indefinite. The material composing this layer is stained with yellow and brown and in the lower part is strongly mottled. The lower subsoil layer ranges from gray plastic sandy clay to pink or reddish-brown fine sandy loam. In places sand and stream gravel and in others sandy and gravelly till are reached below a depth of 30 inches. Plate 2, *B* shows a typical profile of this soil.

On account of its low-lying position and the impervious character of the subsoil the land is poorly drained.

In the lake plain in the western part of the county, narrow strips of this soil extend along many small drainageways, in places spreading out into broader areas. Many of the narrow and some of the broader strips extend into areas planted to apple orchards. Many trees on this soil grow to good size, but most of them die or become unproductive before reaching maturity.[6]

Both Colwood loam and Colwood fine sandy loam extend as long narrow strips or belts along small drainageways, principally north of the ridge in the western part of the county. Numerous strips of this kind occur in the vicinity of Hilton and westward to the county line.

Much of this soil is alkaline from near the surface into the subsoil, and, although poorly drained, it produces good red clover and alsike clover. It is used to a large extent for grassland and to some extent for cultivated crops.

[6] See footnote 4, p. 12.

Colwood fine sandy loam.—Colwood fine sandy loam differs from Colwood loam, mainly in its slightly more sandy texture. It is closely associated with Colwood loam, in general occupying the more narrow strips in the lake plain, especially west of Genesee River. As mapped it includes areas of loam and even of silt loam. It occurs in the same positions and has about the same crop value as the loam.

Colwood fine sandy loam consists of dark-gray or dark grayish-brown fine sandy loam to a depth of about 10 inches, below which the material is light gray, in places almost white. This extends to a depth ranging from 15 to 18 inches. It is strongly mottled in the lower part with yellow and rusty brown. Below this is gray plastic sandy clay or reddish-brown sandy material which, in places, contains gravel.

Several areas of the fine sandy loam are northwest of Chili Center in the southern part of the county, and several bodies are in the vicinity of West Henrietta Station.

Granby sand.—Granby sand consists of dark-gray loamy sand or fine sand, which is granular at the surface and extends to a depth of about 12 inches. Below this is light-gray or almost white light fine sandy loam continuing to a depth of about 24 inches, which gradually becomes heavier with increasing depth. The upper part is stained with yellowish brown, the lower part strongly mottled gray and rusty brown, and, in places, soft rusty-brown concretionary material is present. Below this is light-brown and gray fine sandy loam, interbedded with thin layers of clay or sandy clay, and below a depth of 36 inches the material is loamy sand. The subsoil and substratum, however, are decidedly variable. The surface soil and upper part of the subsoil are acid. A sample of the typical surface soil shows a pH value of 5, the upper part of the subsoil a pH value of 6, the lower part of the subsoil a pH value of 7, and the substratum, below a depth of 36 inches, a pH value of 8.

Rather broad areas of this soil north of the ridge in the town of Irondequoit and in the town of Greece are used for truck growing. Where drained and well fertilized, the land returns good yields of truck crops of many varieties.

Toledo silt loam.—Toledo silt loam consists of dark-gray or nearly black friable silt loam to a depth of about 10 inches. This is underlain by lighter gray silt loam which, in many places, is slightly lighter in texture, stained with yellowish brown, and mottled with rusty brown and gray in the lower part. At an average depth of about 24 inches this material is underlain by gray plastic clay or sandy clay. In places a deep substratum of till is reached below a depth of 30 inches. The soil is alkaline at or near the surface, and the subsoil effervesces freely with acid.

This soil occurs principally as long, narrow, low-lying belts and strips but also in broader areas. It is used principally as grassland and for forestry, but where conditions are favorable it can be used for tilled crops.

Toledo silt loam is well supplied with the necessary plant nutrients and where drained is highly productive and is used for onions, lettuce, cabbage, and other truck crops. It is potentially a good soil, but its most objectionable feature is lack of drainage.

Numerous small areas of this soil lie south of the ridge in the eastern part of the county.

Toledo silt loam, deep phase.—The topsoil of Toledo silt loam, deep phase, is darker than the corresponding layer of the typical soil, contains more organic matter, approaching a muck, and occurs for the most part in broad flat areas rather than in narrow strips. An area lies a short distance east of Ogden Center. Good drainage is lacking.

In a typical area near West Sweden the surface soil to a depth of 15 inches is black very granular loam containing much partly decomposed organic matter. Below this and extending to a depth of 24 inches is bluish-gray plastic tough calcareous clay, and below this is brown or reddish-brown tough clay. In many places the dark surface layer is thicker than 15 inches and the tough brown clay is not reached within a depth of 3 feet. Some of the land that has been drained is used for truck crops, but the greater part of it is in forest.

Wayland silt loam.—The 6-inch surface soil of Wayland silt loam consists of dark-gray or dark grayish-brown light-textured silt loam. Below this and extending to a depth of about 15 inches is lighter gray silt loam slightly mottled with yellowish brown. Below this and extending to a depth of about 24 inches is brown slightly mottled heavy silt loam. The lower subsoil layer, extending to a depth of about 4 feet, is gray heavy silty clay loam which is tough, plastic, and highly mottled with rusty-brown spots. Below this the color is mottled darker brown.

The relief is flat or gently undulating, and the soil occurs as recent alluvial areas subject to overflow during periods of high water. It is mapped in numerous small bodies in the southern and southeastern parts of the county where it is rather important. It is used largely as pasture and hay land and when drained is well suited for the growth of alsike clover and timothy.

This soil occurs as small narrow and irregular areas east, southeast, south, and north of Fairport, near Rochester Junction, and south of Rush. It is associated with areas of Wayland silty clay loam and Wayland fine sandy loam, which are less extensive than the silt loam.

Wayland silty clay loam.—Wayland silty clay loam differs from Wayland silt loam in that it is somewhat heavier in texture, has a harder cloddy structure, the gray layer is more strongly developed, and drainage is not quite so good. It is less extensive than Wayland silt loam and is used almost entirely as hay and pasture land or for forestry. The forest growth consists of maple, beech, ash, oak, and other trees and shrubs.

Wayland fine sandy loam.—The 10-inch surface soil of Wayland fine sandy loam consists of dark-gray fine sandy loam, and below this the material is light-gray or almost white fine sandy loam mottled in the lower part with rusty brown. This layer extends to a depth of about 18 inches, and the lower subsoil layer is reddish-brown fine sandy loam or silt loam.

This soil is used in about the same way as Wayland silt loam. It is inextensive.

MISCELLANEOUS LAND TYPES

Muck.—Muck consists of dark-brown or nearly black partly decomposed organic matter mixed with mineral silt and clay. In the upper part it is fairly well decomposed with but little evidence of organic structure remaining, but below a depth of about 15 inches decomposition is not so advanced, the color is slightly lighter brown, and in places the material is coarse and fibrous, approaching peat in character. Much of it is acid or about neutral.

The character and thickness of muck and of the underlying material differ considerably, the greater part of the true muck having a thickness of 3 feet or more and some of it many feet. The thickness of the beds, in most places, is less near the margin of the areas than in the interior and less in broad depressions than in bodies occurring along stream channels and valley troughs. The underlying material differs with the position in which the muck has been developed. In the uplands it may consist of bluish-gray clay, compact glacial till, or nearly white highly calcareous marl; and in the valleys it may consist of sandy alluvial material.

Muck is rather widely distributed throughout the county, although none of the areas is large, and only a small part of the total area is drained and under cultivation. Where drained and cleared, muck is used for growing celery, lettuce, onions, potatoes, and other crops. In some seasons the yields are large, but they are, in general, somewhat uncertain.

Areas of muck occur near Mendon Ponds, north and east of Fairport, in the vicinity of Riga Center, and south of Sweden Center.

Muck, shallow phase.—The shallow phase of muck resembles typical muck at the surface, but the material ranges from only a few inches to 2 feet in thickness and is underlain by light-gray heavy silt or clay. A number of small bodies of this shallow muck occur in the lake plain in the western part of the county. None of the land is in cultivation, as it is undrained. It supports a forest growth or a growth of vines and shrubs.

A profile of shallow muck observed near the German Church and Chase roads in the western part of the county shows the following characteristics: To a depth of 5 inches is nearly black fibrous muck full of roots and having a fine-granular structure. The pH value is 7. Below this the roots are less abundant and the granular structure changes to small cloddy with the irregular clods ranging in diameter from one-fourth to one-half inch. This structure is most pronounced in the lower part. The pH value is 6.5. Below a depth of 12 inches is olive-gray sticky silt loam or heavy fine-textured loam containing irregular rusty-brown spots in moderate abundance. The pH value is 8. This material extends to a depth of about 19 inches, below which it grades into light-brown or grayish-brown stratified light fine sandy loam. The brown mottlings are less abundant than in the layer above. Below a depth of 36 inches are thin layers of sand, loam, and gravel.

Carlisle muck.—Carlisle muck consists of well-decomposed alkaline or calcareous material, 30 or more inches thick, underlain by nearly white highly calcareous marl. A few areas of this type of muck occur in the southern and southeastern parts of the county.

Very little of the land is under cultivation, although it may be used for crops.

Edwards muck.—Edwards muck consists of highly calcareous, not very well decomposed shallow muck underlain at a depth of about 15 inches or less by marl. On account of its calcareous character and shallowness, this land is practically nonagricultural. It supports a forest growth of small maple, ash, elm, and other trees.

A narrow belt of this muck extends east and west north of Belcoda, and a small area is west of Scottsville.

Coastal beach.—Coastal beach includes an area of sandy and gravelly material forming beaches and bars along the Lake Ontario front across a considerable part of the county. It consists mainly of an assortment of gravel, cobbles, sand, and fine sand to a depth ranging from 1 to several feet. In places it forms low bars separating, or almost separating, bays and ponds from the lake, and in other places it extends as a narrow slightly higher belt along the lake front. It has very little agricultural value but in places supports a forest growth. It is used extensively as building sites for summer cottages.

Meadow.—The classification meadow has been given to a few small areas, principally in narrow valleys, in which several soils have been so intricately mixed that their separation does not seem advisable. These bodies, as a rule, are of low agricultural value and are used, for the most part, as grassland or for forests.

Marsh.—Marsh consists of areas permanently or frequently covered by shallow water and supporting a growth of rushes, cattails, and other water-loving plants. The soils underneath the water are variable but for the most part consist of dark-colored mucklike or silty soil underlain by light-gray silty clay or sandy clay. These marsh areas occur principally in the lake plain near the lake.

In other parts of the county where marsh symbols are shown on the map, the water in general is not so deep. The marshes could be drained, and the soils are mapped, so far as possible, regardless of their present marshy condition.

Made land.—The term "made land" is applied to masses of earth, gravel, and stone dredged from the Barge Canal and other excavations, road and railroad fills, and dumps of unassorted soil material. It has practically no agricultural value.

Rough broken land.—Areas too steep, broken, and stony for either tillable or pasture land and of but little value for forestry have been classed as rough broken land.

Riverwash.—Riverwash consists of sandy, gravelly, and stony material deposited in stream flood plains. Most of it is subject to overflow and is of practically no agricultural value. On Irondequoit Creek material of this kind has been deposited below the crossing of the Barge Canal.

Gravel pits.—In a number of places the surface soil and underlying gravel have been removed from areas, several acres in extent, leaving the unweathered till or rock beds exposed at the surface. Such areas are of practically no value for agricultural purposes. Many small bodies of this kind have not been outlined on the map.

Unclassified city land.—Unclassified city land, as its name im-

plies, includes nonagricultural areas within the limits of the city of Rochester. More than 25 square miles are accounted for in this classification.

SOIL ADAPTATIONS

On account of the importance of fruit growing in this county a brief consideration of soil adaptation for fruit crops seems advisable, especially at this time, when many old orchards have become less productive or have ceased producing and are being removed. This decreased production has been caused by excessive moisture and poor drainage, especially during 1925–26; to neglect, owing to low fruit prices and (more recently) bad economic conditions; and to the low temperature and severe winter-killing in February 1934. Many new plantings, to take the place of these old orchards, will be made, and in making them the best available sites should be selected.

For best development, apple trees require deep well-drained soils of medium texture. On such soils many varieties, before reaching maturity, root to a depth of 8 feet or more. Good growth and fair yields may be obtained on soils of less depth, but on shallow soils, unfavorable seasonal conditions—either drought or excessive precipitation—influence production to a greater extent than on soils in which rooting is deeper.

Owing to climatic conditions and the protection afforded by Lake Ontario, the best protected fruit belt is in the northern half of the county. Within this belt some soils well adapted for fruit growing because of climatic conditions are not considered good soils for fruit in places outside the belt.

Color is one of the best indications of a good soil for tree fruits. In this section, a good soil for fruit is dark brown or slightly reddish brown to a depth of about 8 inches and lighter brown or lighter reddish brown below. The subsoil is free from layers of light gray or light gray mottled with yellow and rusty brown. A poor soil for orchards, on the other hand, has a dark-gray or black surface soil, ranging from 6 to 15 inches in thickness, underlain by subsoil material of light gray or light gray strongly mottled with rusty brown.

The texture of the soil also is important. Soils of medium texture, such as sandy loams, loams, silt loams, and clay loams, are, as a rule, preferable to very loose sand and gravel or to tight impervious clay. Loose light-textured soils are low in fertility and do not hold moisture well, and the heavy clay soils do not allow good drainage or deep penetration of roots.

The structure of the subsoil and of the underlying material is important. In some soils developed from till lying at a depth ranging from 2 to 3 feet, the till is compact and the layer above it is moderately mottled with gray and rusty brown. Roots do not penetrate this compact layer, and production is at times not so good as on soils in which rooting is deeper. The Hilton soils are of this kind. Other soils contain very compact layers of fine sand or fine sandy loam in the substratum, which also check downward movement of moisture and root penetration. Layers of this kind occur in the substrata of the Collamer, Berrien, and some other soils.

Both surface drainage and underdrainage are important. Where the orchard site is flat or impervious layers occur in the subsoil, surface drainage must be depended on to carry off excess precipitation. Poorly drained areas, in general, occupy low-lying belts or flat land and have light-gray and mottled subsoils. In them the ground water, during a part of the year, is near the surface. Poorly and imperfectly drained soils, however, are not confined to low-lying areas but, in places, occur on the tops of ridges and on slopes.

The best soils for apples within the fruit belt are the Dunkirk, Alton, and some of the Ontario soils. Medium soils for orchards include the Clarkson and some of the Hilton, Berrien, and Arkport soils. Medium to poor soils include the Collamer, Lucas, Schoharie, and Petoskey soils; and poor soils include the Lockport, Granby, Fulton, Poygan, and all soils of the stream valleys.

The sandier types of the better soils are adapted to cherries and peaches, and parts of the less well-drained soils may be used for pears and quinces.

Soils well supplied with lime are best suited for clovers and alfalfa. These include the Palmyra, Honeoye, Ontario, Farmington, Dunkirk, Lucas, and some others, although much of the Farmington soils is too shallow and the Dunkirk and Lucas soils are used for this crop to only a small extent.

Potatoes produce best on a soil less well supplied with lime than that required for alfalfa. The Ontario and Worth soils are well adapted to growing potatoes, although good potatoes are grown on other soils, mainly south of the ridge.

Cabbage produces best on the heavy soils and, apparently, is not greatly influenced by the lime supply. Good cabbage is grown on the heavier types of the Ontario, Honeoye, Palmyra, Dunkirk, Worth, and other soils. Lighter types of these same soils, also of the Clarkson and Hilton soils, seem well suited to tomatoes. These lighter soils, also sandy types of the Dunkirk, Berrien, and other of the fine sandy loams and loamy fine sand soils are used for other truck crops.

PRODUCTIVITY RATINGS

Table 3 gives a rating of the soil types, phases, and miscellaneous land types in Monroe County, according to their productivity for each of the important crops grown.

TABLE 3.—*Productivity ratings of soils in Monroe County, N. Y.*

Soil	Crop-productivity index [1] for—																Productivity grade according to—		Principal crop or type of farming
	Corn (grain)	Corn (silage)	Wheat	Oats	Timothy hay	Red clover	Alsike clover	Alfalfa	Field beans	Potatoes	Cabbage	Tomatoes	Vegetables [2]	Vegetables [3]	Apples	Permanent pasture	Current practices [4]	Inherent productivity [5]	
Honeoye loam	70(90)	70(100)	70(100)	80(100)	80(100)	80(100)	------	70	60(90)	50(60)	70(90)	60(80)	30(50)	70(90)	60(70)	80	1	3	General,[6] cabbage.
Ontario loam, yellow-subsoil phase	50(80)	60(100)	60(90)	70(90)	80(100)	80(100)	------	60(70)	60(90)	50(70)	70(90)	70(90)	30(50)	70(90)	60(90)	80	1	3	General, truck.
Ontario silt loam	50(80)	60(100)	60(90)	70(90)	80(100)	80(100)	------	60(70)	60(90)	50(70)	60(100)	60(100)	30(50)	60(80)	60(90)	80	1	3	General.
Ontario loam	50(80)	60(100)	60(90)	70(90)	80(100)	80(100)	------	60(70)	60(80)	50(80)	60(100)	60(100)	30(50)	60(80)	60(90)	80	1	3	Do.
Ontario gravelly loam	50(80)	60(100)	60(90)	70(90)	80(100)	80(100)	------	60(70)	60(80)	50(80)	60(100)	60(100)	30(50)	60(80)	60(90)	80	1	3	Do.
Dunkirk silt loam	50(80)	60(90)	50(90)	50(80)	60(80)	70(100)	------	50(70)	50(80)	40(60)	60(80)	60(90)	40(60)	60(80)	70(100)	80	2	4	Fruit, general
Palmyra gravelly loam	50(80)	60(80)	60(80)	60(90)	70(90)	80(100)	------	60(70)	60(90)	50(70)	60(80)	70(100)	30(50)	70(100)	60(80)	70	2	4	General, beans, alfalfa.
Ontario fine sandy loam, yellow-subsoil phase.	40(70)	60(90)	50(80)	60(80)	70(90)	70(90)	------	40(60)	50(80)	50(80)	60(100)	60(100)	30(50)	60(90)	50(90)	70	2	4	General, truck.
Ontario fine sandy loam	40(70)	50(90)	50(80)	60(80)	70(90)	70(90)	------	40(60)	50(80)	60(90)	60(100)	60(100)	30(50)	60(80)	50(90)	70	2	4	General, potatoes.
Palmyra gravelly loam, heavy phase.	50(80)	60(80)	60(80)	60(90)	80(90)	80(100)	------	70	60(80)	40(60)	60(80)	60(80)	30(50)	60(80)	50(70)	80	2	4	General.
Genesee silt loam, high phase.	60(80)	70(100)	60(80)	60(80)	80(100)	80(100)	------	60(70)	60(80)	40(60)	70(80)	60(90)	40(60)	60(90)	40	100	2	3	General, corn.
Dunkirk fine sandy loam	50(80)	50(80)	50(80)	60(80)	50(70)	60(80)	------	40(60)	40(70)	40(60)	50(70)	60(90)	30(40)	60(100)	60(100)	60	3	5	Fruit, truck, general.
Genesee fine sandy loam, high phase.	60(80)	60(100)	60(80)	60(80)	60(90)	70(100)	------	50(70)	60(80)	40(60)	70(80)	50(80)	40(60)	70(90)	40	90	3	4	General, corn.
Palmyra gravelly fine sandy loam.	40(70)	60(80)	50(80)	50(80)	60(80)	60(90)	------	50(60)	50(80)	40(70)	50(70)	60(90)	30(50)	60(90)	50(70)	60	3	5	General.
Honeoye silt loam, shallow phase.	40(60)	50(80)	50(80)	50(80)	60(80)	70(90)	------	50	60(90)	40(60)	60(80)	60(80)	20(40)	60(80)	40(50)	70	3	5	Do.

[1] The productivity of each of the various soil types for each specific crop is compared to a standard—100, which stands for the inherent productivity of the most productive soil (or soils) of significant acreage in the United States for that crop. Figures without parentheses indicate the inherent productivity of the soils for the specified crops, whereas figures in parentheses indicate the productivity under current practices which include the use of soil amendments, such as lime, commercial fertilizers, and manure from concentrated feeds not grown on the land.

[2] Vegetables doing best on organic soils, e. g., onions, celery, lettuce.

[3] Vegetables not requiring highly organic soils.

[4] This classification indicates the comparative general productivity of the soils under current farm practices. Refer to the text for further explanation.

[5] The inherent productivity grade refers to the relative inherent ability of the soil to produce without amendments.

[6] General farming, as used here, refers chiefly to the growing of hay, oats, and silage corn for the feeding of livestock, principally dairy cows. A relatively small acreage may be used also for growing cash crops, such as potatoes, fruits, or vegetables.

TABLE 3.—*Productivity ratings of soils in Monroe County, N. Y.*—Continued

Soil	Crop-productivity index for—																Productivity grade according to—		Principal crop or type of farming
	Corn (grain)	Corn (silage)	Wheat	Oats	Timothy hay	Red clover	Alsike clover	Alfalfa	Field beans	Potatoes	Cabbage	Tomatoes	Vegetables	Vegetables	Apples	Permanent pasture	Current practices	Inherent productivity	
Honeoye loam, shallow phase.	40(60)	50(80)	50(80)	50(80)	60(80)	70(90)	------	50	60(90)	40(60)	60(80)	60(80)	20(40)	60(80)	40(50)	70	3	5	General
Clarkson gravelly loam	40(70)	50(80)	50(70)	50(80)	60(80)	60(80)	------	20(50)	50(70)	40(60)	50(70)	50(70)	30(40)	50(70)	50(70)	70	3	5	Fruit, tomatoes, general
Collamer silt loam, light-textured phase.	40(60)	50(70)	50(70)	50(80)	60(80)	------	50(70)	40(50)	40(60)	30(50)	60(80)	50(70)	30(40)	60(80)	50(80)	70	3	5	General, fruit.
Hilton gravelly loam	40(70)	50(80)	50(70)	60(80)	60(80)	------	60(80)	20(50)	50(70)	40(60)	50(70)	50(70)	30(40)	50(70)	40(60)	70	3	5	Do.
Clarkson loam	40(60)	50(80)	50(70)	50(80)	60(80)	60(80)	------	20(50)	50(70)	40(60)	50(70)	40(60)	30(40)	50(70)	40(60)	70	3	5	Fruit, tomatoes, general.
Collamer silt loam	40(60)	50(70)	50(70)	50(80)	60(80)	------	50(70)	30(40)	40(60)	30(50)	60(80)	50(70)	30(40)	60(80)	50(70)	70	4	5	General, fruit.
Berrien fine sandy loam	40(70)	40(70)	50(70)	50(80)	40(60)	40(60)	------	10(50)	40(70)	30(50)	40(60)	60(90)	20(30)	60(90)	50(90)	50	4	6	Fruit, general.
Genesee silt loam [7]	70	80	40	50	80	50	------	30	60	40	60	50	40	60	------	90	4	4	Corn, general
Alton gravelly fine sandy loam.	40(60)	40(60)	40(60)	40(60)	50(70)	50(70)	------	30(60)	40(70)	40(60)	40(60)	50(80)	20(30)	50(80)	50(100)	40	4	6	Fruit, truck.
Worth loam, brown-subsoil phase	40(60)	50(70)	50(70)	50(80)	50(70)	50(70)	------	10(45)	30(50)	50(70)	40(60)	50(80)	20(30)	50(80)	50(70)	70	4	6	General.
Schoharie fine sandy loam	40(60)	50(70)	50(70)	50(80)	50(70)	50(70)	------	40(60)	40(60)	40(60)	50(70)	40(60)	30(40)	50(70)	50(70)	60	4	5	Small grain, hay
Schoharie gravelly silt loam	50(70)	50(70)	50(70)	50(80)	60(80)	60(80)	------	40(50)	40(60)	30(50)	50(70)	40(60)	20(30)	50(70)	40(50)	70	4	5	Small grain, hay, truck.
Schoharie silt loam	40(50)	50(60)	50(70)	50(80)	60(80)	60(80)	------	40(60)	40(60)	30(50)	60(70)	50(70)	30(40)	50(70)	[8] 40(50)	70	4	5	Small grain, hay.
Worth loam	40(60)	50(70)	50(70)	50(80)	50(70)	------	50(70)	(45)	30(50)	50(70)	40(60)	50(80)	20(30)	50(80)	50(60)	70	4	6	General
Lucas silty clay loam	30(50)	40(60)	40(70)	50(70)	60(80)	50(70)	------	40(50)	40(60)	20(40)	50(70)	40(60)	20(30)	50(70)	[9] 50(60)	80	4	6	General, cabbage, alfalfa
Ontario loam, rolling phase	40(50)	40(50)	50(60)	50(60)	70(90)	60(80)	------	60	50(60)	40(50)	40(50)	50(60)	20(30)	50(60)	40(60)	70	4	5	Pasture, hay, general.
Genesee fine sandy loam [7]	70	80	40	50	70	50	------	30	60	40	60	50	40	60	------	80	4	4	Corn, general.
Hilton fine sandy loam	40(60)	50(70)	40(60)	40(60)	50(70)	------	60(80)	20(50)	40(60)	40(60)	50(70)	50(70)	20(30)	50(70)	[9] 50(70)	60	4	6	General, fruit.
Worth gravelly loam, brown phase.	40(60)	50(70)	50(70)	50(80)	50(70)	------	50(70)	10(45)	30(50)	50(70)	40(60)	50(70)	20(30)	50(70)	40(50)	60	4	6	General.
Farmington loam	40(60)	40(60)	50(70)	40(60)	50(70)	60(80)	------	40(60)	50(80)	40(60)	50(70)	40(60)	30(40)	50(70)	30(40)	70	4	6	General, pasture.
Farmington gravelly loam	40(60)	40(60)	50(70)	40(60)	50(70)	60(80)	------	30(60)	50(80)	40(60)	50(70)	40(60)	30(40)	50(70)	30(40)	70	4	6	Do
Clarkson loam, shallow phase.	40(60)	50(70)	50(70)	50(70)	50(70)	50(70)	------	10(40)	50(70)	30(50)	50(70)	30(50)	20(30)	50(70)	30(50)	60	4	6	General.
Worth fine sandy loam	40(60)	50(70)	50(70)	50(80)	40(60)	------	40(60)	10(40)	30(50)	60(80)	40(60)	50(80)	20(30)	50(80)	40(50)	60	4	6	Do.

Worth stony loam, brown phase.	30(50)	40(60)	50(70)	50(80)	50(70)	------	50(70)	10(40)	30(50)	40(60)	40(60)	50(70)	20(30)	50(70)	40(50)	50	4	6	Do.
Brockport gravelly loam	40(60)	40(60)	40(60)	40(60)	50(70)	40(70)	------	30(50)	40(60)	30(40)	50(70)	40(60)	20(30)	50(70)	[8]40(60)	70	4	6	General, cabbage
Brockport silt loam	40(60)	40(60)	30(50)	40(60)	50(70)	50(70)	------	30(50)	40(60)	20(40)	50(70)	40(60)	20(30)	50(70)	[8]30(50)	70	4	6	General, alfalfa, pasture.
Worth gravelly fine sandy loam, brown phase.	30(60)	50(70)	50(70)	50(80)	40(60)	40(60)	------	10(45)	30(50)	40(60)	40(60)	50(70)	20(30)	50(70)	40(50)	50	4	6	General.
Hamlin silt loam [7]	60	70	30	40	70	40	------	30	50	40	50	50	30	60	------	80	4	4	Pasture, hay, corn.
Ontario fine sandy loam, rolling phase.	30(40)	30(40)	40(50)	40(60)	60(80)	60(80)	------	50(60)	40(50)	40(50)	40(50)	50(60)	20(30)	50(60)	50(60)	60	4	5	Pasture, general.
Hilton gravelly loam, heavy-subsoil phase.	30(60)	50(70)	40(60)	50(70)	40(60)	------	50(70)	20(40)	40(60)	30(40)	50(70)	40(60)	30(40)	50(70)	[8]30(50)	60	4	6	General, fruit.
Hilton fine sandy loam, heavy-subsoil phase.	40(60)	50(70)	40(60)	50(70)	40(60)	------	50(70)	20(40)	40(60)	30(40)	50(70)	40(60)	30(40)	50(70)	[9]30(50)	60	4	6	Do.
Arkport very fine sandy loam.	30(50)	30(50)	30(50)	30(60)	30(50)	40(60)	------	30(60)	30(50)	30(50)	30(50)	40(60)	20(30)	40(70)	[9]40(90)	50	4	7	Fruit, truck.
Lockport silty clay loam, brown phase.	40(60)	40(60)	60(80)	40(70)	40(60)	------	40(60)	20(35)	30(50)	20(40)	40(60)	30(50)	20(30)	40(60)	30(40)	70	5	6	Hay, pasture, cabbage.
Fulton silt loam	40(60)	40(60)	40(60)	60(70)	50(70)	------	50(70)	20(40)	30(50)	30(40)	50(70)	40(60)	30(40)	50(70)	[8]30(40)	60	5	6	General.
Worth stony fine sandy loam, brown phase.	40(60)	50(70)	40(60)	40(70)	40(60)	------	40(60)	10(40)	30(50)	40(60)	40(60)	50(70)	20(30)	50(70)	30(50)	40	5	7	Do.
Ontario loamy fine sand	30(60)	30(60)	40(60)	40(60)	40(60)	40(60)	------	30(50)	30(60)	40(60)	40(60)	50(70)	20(30)	50(70)	[9]30(50)	50	5	7	General, truck.
Riga silt loam	40(60)	40(60)	40(60)	50(70)	50(70)	50(70)	------	30(55)	40(60)	30(50)	40(60)	40(60)	20(30)	40(60)	30	60	5	6	Hay, pasture, general
Riga silt loam, gravelly phase.	40(60)	40(60)	40(60)	50(70)	50(70)	50(70)	------	30(55)	40(60)	30(50)	40(60)	40(60)	20(30)	40(60)	30	60	5	6	Do.
Hamlin fine sandy loam [7]	60	70	------	40	60	40	------	------	50	40	50	50	30	60	------	70	5	5	Pasture, hay, corn.
Hilton gravelly loam, shallow phase.	40(60)	40(60)	40(60)	40(60)	40(60)	------	50(70)	20(40)	40(60)	30(40)	50(70)	40(60)	20(30)	50(70)	20(30)	60	5	7	General.
Alton coarse sandy loam	40(60)	40(60)	30(50)	30(50)	30(50)	30(50)	------	20(50)	30(50)	30(50)	30(50)	40(60)	10(20)	40(60)	[9]40(80)	20	5	7	Fruit.
Toledo silt loam (drained)	50(70)	60(80)	30	60(70)	70(90)	------	80	------	60(80)	------	70(100)	50(60)	60(80)	70(90)	------	80	5	6	Truck, hay, corn.
Colwood loam (drained)	50(60)	50(70)	40(60)	50(70)	60(80)	50(80)	60(80)	------	50(70)	30(50)	50(80)	40(60)	40(70)	50(80)	------	70	5	6	Hay, general pasture
Colwood fine sandy loam (drained).	50(60)	50(70)	40(60)	50(70)	60(80)	------	60(80)	------	50(70)	30(50)	50(80)	50(70)	40(70)	50(80)	------	60	5	6	Do.
Tonawanda silt loam	50(60)	50(60)	50(60)	50(70)	60(80)	40(70)	------	20(40)	50(70)	30(50)	50(70)	50(70)	30(40)	50(70)	------	80	5	6	General.
Groton gravelly loam	30(50)	30(50)	30(50)	30(50)	40(60)	40(60)	------	30(50)	40(60)	30(50)	40(60)	40(60)	20(30)	40(60)	[9]30(50)	50	5	7	General, pasture.
Groton gravelly fine sandy loam.	30(50)	30(50)	30(50)	30(50)	40(60)	40(60)	------	30(50)	40(60)	30(50)	40(60)	40(60)	20(30)	40(60)	[9]30(50)	40	5	7	Do.
Berrien loamy fine sand	30(50)	30(50)	30(50)	30(60)	30(40)	30(40)	------	10(50)	30(50)	30(50)	30(60)	40(60)	20(30)	40(70)	[8]40(70)	30	5	7	Fruit, general.
Lyons loam, gravelly phase	30(50)	40(60)	30(50)	40(60)	50(70)	------	40(60)	------	20(50)	20(30)	30(50)	40(60)	30(50)	40(60)	20(40)	60	5	7	Corn, truck, general.
Berrien fine sandy loam, imperfectly drained phase.	30(50)	40(60)	30(50)	40(60)	40(60)	30(50)	30(50)	30(50)	40(60)	20(40)	40(60)	50(70)	30(40)	50(70)	[8]20(30)	40	5	7	General.
Eel silt loam (drained)	40	70	50	60	80	------	60	------	60	20	70	50	60	70	------	90	5	5	Corn, hay, pasture.
Eel fine sandy loam (drained).	40	70	50	60	80	------	60	------	60	20	70	50	60	70	------	80	5	5	Do.

[7] No ratings are given for the protected condition, as these soils are subject to overflow.
[8] These indexes refer to pears instead of apples.
[9] These indexes refer to peaches instead of apples.

TABLE 3.—*Productivity ratings of soils in Monroe County, N. Y.*—Continued

Soil	Crop-productivity index for—																Productivity grade according to—		Principal crop or type of farming
	Corn (grain)	Corn (silage)	Wheat	Oats	Timothy hay	Red clover	Alsike clover	Alfalfa	Field beans	Potatoes	Cabbage	Tomatoes	Vegetables	Vegetables	Apples	Permanent pasture	Current practices	Inherent productivity	
Alton loamy sand	20(40)	20(40)	30(50)	30(50)	20(40)	30(50)	------	20(50)	30(50)	30(50)	30(50)	40(60)	10(20)	40(60)	[9] 40(70)	20	6	8	Fruit, truck.
Alton coarse sandy loam, light-textured phase	20(40)	20(40)	30(50)	30(50)	20(40)	30(50)	------	20(50)	30(50)	30(50)	30(50)	40(60)	10(20)	40(60)	[9] 40(70)	20	6	8	Fruit.
Farmington sandy loam	20(40)	20(40)	30(50)	30(50)	40(60)	40(60)	------	20(50)	30(50)	30(50)	20(40)	30(40)	20(30)	30(50)	30(40)	30	6	7	General.
Schoharie silty clay loam	30(50)	30(50)	30(50)	40(50)	50(70)	------	40(60)	30(50)	30(40)	20(30)	30(50)	20(40)	10(20)	30(50)	[5] 20	50	6	7	Hay, small grain.
Groton loamy sand	20(40)	20(40)	30(50)	30(50)	30(50)	40(60)	------	30(50)	30(50)	30(50)	30(50)	30(50)	20(30)	30(50)	[9] 30(40)	40	6	7	Pasture, general.
Collamer silty clay loam	30(40)	30(40)	20(30)	40(60)	50(70)	------	40(60)	10(25)	30(50)	20(30)	40(60)	30(50)	10(20)	30(50)	[6] 30(40)	40	6	7	Hay, grain, cabbage
Westbury loam	40(60)	50(70)	20(40)	40(70)	40(60)	------	40(60)	20(30)	30(50)	30(40)	50(70)	40(60)	30(40)	50(70)	------	70	6	7	General.
Poygan silt loam (drained)	30(50)	30(50)	30(50)	40(60)	70	------	70	------	20(40)	20(30)	40(50)	30(50)	40(60)	40(60)	------	70	6	7	Small grain, hay.
Ottawa loamy fine sand, mottled-subsoil phase.	30(50)	30(50)	20(40)	30(50)	30(50)	20(40)	------	10(30)	30(50)	30(50)	40(60)	40(60)	20(30)	40(60)	[9] 30(40)	30	6	8	Truck, fruit.
Petoskey loamy fine sand	20(40)	20(40)	20(40)	30(50)	20(40)	30(50)	------	20(45)	30(50)	20(40)	30(50)	40(60)	10(20)	40(60)	[9] 20(50)	20	6	8	Do.
Fulton silty clay loam	20(40)	20(40)	20(40)	30(50)	50(70)	------	40(60)	10(30)	20(40)	20(30)	30(50)	30(50)	10(20)	30(50)	[5] 20	60	6	8	Hay, small grain, pasture
Ottawa loamy fine sand	20(40)	20(40)	20(40)	30(50)	20(40)	20(40)	------	10(40)	30(50)	20(40)	30(50)	40(60)	10(20)	40(60)	[9] 20(40)	20	6	8	Truck, fruit.
Collamer silt loam, poorly drained phase (drained).	30(50)	40(60)	30(40)	40(60)	50(70)	------	40(60)	------	20(40)	10(20)	30(50)	20(40)	20(30)	30(50)	------	50	6	8	General, pasture.
Carlisle muck (drained)	20(40)	40(70)	------	10(40)	40(80)	50(70)	------	------	------	30(60)	30(60)	------	70(100)	50(90)	------	70	7	8	Truck.
Lockport silty clay loam	20(30)	20(30)	30(50)	30(50)	40(60)	------	40(60)	10	30(50)	10(20)	20(40)	30(40)	10(20)	30(40)	------	60	7	8	Pasture, hay.
Granby sand (drained)	20(40)	20(40)	20(40)	30(50)	40(60)	------	40(60)	------	20(40)	10(30)	30(50)	30(50)	10(60)	40(50)	------	50	7	8	Truck.
Farmington cherty loam	20(30)	20(30)	20(30)	30(40)	30(50)	40(60)	------	20(40)	20(40)	20(30)	20(40)	20(30)	10(20)	20(40)	20(30)	50	7	8	Small grain, hay, pasture.
Poygan fine sandy loam (drained).	40	50	40	40	50	------	50	10	30(50)	20	50	50	30	50	------	70	7	7	Hay, small grain, pasture.
Toledo silt loam, deep phase (drained).	30	40	20	30	60	------	70	------	30	------	30(60)	20(40)	60(80)	30(60)	------	60	7	7	Truck, hay, pasture.
Farmington stony loam	20(30)	20(30)	20(30)	20(30)	30(50)	40(60)	------	20(50)	20(40)	10	20(40)	20(40)	10(20)	20(40)	------	40	7	8	Pasture, forest.
Wayland fine sandy loam (drained).	30	40	------	30	80	------	80	------	30	------	30	30	30	30	------	80	7	7	Hay, pasture.
Wayland silt loam (drained)	30	40	------	30	80	------	80	------	30	------	30	30	30	30	------	80	7	7	Do.
Wayland silty clay loam (drained).	30	40	------	30	80	------	70	------	20	------	20	20	30	30	------	80	7	7	Do.

Poygan silty clay loam (drained).	20(30)	20(30)	20(40)	30(50)	70	-------	50	------	20(40)	------	40(50)	30(40)	40(60)	30(50)	-------	70	7	7	Small grain, hay, pasture.
Petoskey loamy fine sand, rolling phase.	10(20)	10(20)	10	20(30)	20(30)	30(40)	------	20(30)	10(30)	20(30)	20(40)	20(40)	10(40)	20(40)	[2] 20(40)	10	8	8	Pasture, forest.
Ottawa loamy fine sand, rolling phase.	10(20)	10(20)	10	20(30)	20(30)	20(30)	------	10(25)	10(30)	20(30)	20(40)	20(40)	10(40)	20(40)	[2] 20(40)	10	8	8	Do.
Eel silt loam (undrained)	------	30	-------	40	60	-------	50	------	30	------	30	-------	20	30	-------	80	8	8	Hay, pasture.
Eel fine sandy loam (undrained).	------	30	-------	40	60	-------	50	------	30	------	30	-------	20	30	-------	80	8	8	Do.
Muck (drained)	------	-------	-------	-------	-------	-------	------	------	------	10(60)	20(90)	20(80)	20(100)	20(100)	-------	60	9	10	Truck.
Collamer silt loam, poorly drained phase (undrained).	10	10	10	20	30	-------	20	------	------	------	-------	-------	-------	------	-------	60	9	9	Pasture.
Toledo silt loam (undrained)	------	-------	-------	-------	40	-------	40	------	------	------	-------	-------	-------	-------	-------	60	9	9	Do.
Poygan silt loam (undrained).	------	-------	-------	-------	40	-------	30	------	------	------	-------	-------	-------	-------	-------	60	9	9	Pasture, hay.
Poygan silty clay loam (undrained).	------	-------	-------	-------	40	-------	30	------	------	------	-------	-------	-------	-------	-------	60	9	9	Pasture.
Dunkirk silt loam, broken phase.	------	-------	10	10	10	20	------	10	------	------	-------	-------	-------	-------	-------	50	10	10	Pasture, forest.
Wayland fine sandy loam (undrained).	------	-------	-------	-------	30	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Pasture.
Wayland silt loam (undrained).	------	-------	-------	-------	30	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Do.
Ontario loam, broken phase	------	-------	-------	-------	10	10	------	10	------	------	-------	-------	-------	-------	-------	60	10	10	Do.
Palmyra gravelly loam, broken phase.	------	-------	-------	-------	10	10	------	10	------	------	-------	-------	-------	-------	-------	50	10	10	Do.
Meadow (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	80	10	10	Pasture, forest.
Wayland silty clay loam (undrained).	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Pasture.
Colwood fine sandy loam (undrained).	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Do.
Colwood loam (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Do.
Lyons silt loam (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Pasture, forest.
Lyons loam (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	70	10	10	Do.
Poygan fine sandy loam (undrained).	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	50	10	10	Pasture.
Schoharie clay loam, broken phase.	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	50	10	10	Do.
Toledo silt loam, deep phase (undrained).	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	40	10	10	Pasture, forest.
Carlisle muck (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	30	10	10	Forest.
Granby sand (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	30	10	10	Do.
Edwards muck (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	30	10	10	Do.
Arkport very fine sandy loam, broken phase.	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	30	10	10	Forest, pasture.
Muck (undrained)	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	20	10	10	Forest.
Muck, shallow phase (undrained).	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	20	10	10	Do.
Petoskey loamy fine sand, steep phase.	------	-------	-------	-------	-------	-------	------	------	------	------	-------	-------	-------	-------	-------	20	10	10	Do.

[1] These indexes refer to pears instead of apples

[2] These indexes refer to peaches instead of apples.

TABLE 3.—*Productivity ratings of soils in Monroe County, N. Y.*—Continued

Soil	Crop-productivity index for—																Productivity grade according to—		Principal crop or type of farming
	Corn (grain)	Corn (silage)	Wheat	Oats	Timothy hay	Red clover	Alsike clover	Alfalfa	Field beans	Potatoes	Cabbage	Tomatoes	Vegetables	Vegetables	Apples	Permanent pasture	Current practices	Inherent productivity	
Ottawa loamy fine sand, broken phase	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	10	Forest, pasture.
Rough broken land	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	10	Forest.
Petoskey loamy fine sand, dune phase.	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	
Coastal beach	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	
Marsh	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	
Made land	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	
Riverwash	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	
Gravel pits	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	10	

NOTE.—Blank spaces, according to position, indicate either that the crop is not commonly grown because of poor adaptation, or that amendments are not commonly used.

The rating compares the productivity of each of the soil types, or other mapping separations, in the county for a given crop to a standard—100. This standard represents the inherent productivity of the most productive soil type (or types) of significant acreage in the United States for the specified crop. These standards of reference are based on yields obtained without amendments on the best soils in the more widely known crop regions. The exceptional and inextensive soil types which are especially well adapted to a particular crop receive indexes above 100. In this way standards are not established so high that large areas known for their production of a particular crop receive very low relative ratings. A soil estimated to be about half as productive for a specified crop as a soil with a rating of 100 receives an index of 50.

The inherent productivity indexes are based on the ability of the land to produce under a system of management capable of maintaining the inherent level of productivity without the use of soil amendments. The inherent level of production is conceived to be the level at or near that existing when the virgin condition became adjusted to tillage practices. In those instances where phases are mapped to show present conditions of erosion, shallowness, relief, or other modifications which have resulted from continued tillage, the rating applies to the present production without amendments rather than to the inherent productivity as defined.

Under current farming practices in Monroe County, amendments, such as lime, phosphate, complete commercial fertilizer, and manure produced from concentrated purchased feeds, are commonly used. The use of manure produced from feed grown on the land is not considered an amendment. Because the index of inherent productivity does not express the responsiveness of soils to fertilizer, and also because in many instances it does not represent production as obtained by current practices, a second index is used in parentheses to show the productivity of the soil with amendments. This rating attempts to picture the production obtained under the current practices of the average or better-than-average farmers of the county. In this way the influences of management and techniques are roughly evaluated. The same standard of reference is used as for the inherent crop-productivity index.

The factors influencing the inherent productivity of land are mainly those of climate, soil, and relief, or lay of the land. All are concerned in the determination of the productivity ratings, and low ratings for a particular crop may as likely be due to an unfavorable climate or to unsuitable slope conditions as to lack of fertility in the soil. As long-time crop yields furnish the best available summation of the factors contributing to soil productivity, they have been made the basis, so far as such information is available, for the determination of the indexes.

In instances of those soils, parts of which have been artificially drained, ratings are given both for the drained and undrained conditions. The cost or difficulty of providing drainage plays no part in the productivity rating of such lands. Two soils having the same productivity when drained are rated the same, although adequate artificial drainage may cost 10 times as much on one as on the other.

In certain instances, however, a lack of information may preclude the giving of any rating other than for the natural condition.

In addition to productivity indexes for each important crop, each soil type, phase, or miscellaneous land type is assigned two general productivity ratings or grades of agricultural quality. These ratings are based on the ability of the soils to produce the crops of the general agricultural region in which they occur. The rating, "Current practices," in the left-hand column under "Productivity grade" is obtained from a weighted average of the crop indexes in parentheses, and the rating in the right-hand column is obtained from a weighted average of the inherent productivity indexes. These averages have been obtained by weighting each crop productivity index according to the approximate percentage of the cropland occupied by the specified crop in the general agricultural region. Allowances have been made for variations in acreage trends in the county, and to some extent, for differences in crop-acre values. The making of a general rating involves many considerations, and certain arbitrary assumptions have been made to obtain a reasonable result. If the weighted average for the crop productivity indexes falls between 90 and 100, the soil type is assigned a productivity grade of 1; if the weighted average falls between 80 and 90, a grade of 2 is given, etc. In the instance of those soils which are not amended under practices of current management, the grade for current practices is the same as that for inherent productivity. Although a soil may be the most productive in a county or region, it does not necessarily receive a rating of 1, since that rating is given only to those soils obtaining a weighted average of 90 or above. In Monroe County, however, Honeoye silt loam and several of the Ontario soils are rated 1 under current practices and 3 according to inherent productivity.

The importance of fruit growing in Monroe County results in certain of the lighter textured soils (such as the Alton, Berrien, and Arkport) that are well suited to fruit receiving higher productivity grades in this county than similar soils receive in other counties where the hays and grains are relatively more important. The importance of fruit also results in the Genesee soils receiving a lower productivity grade under current practices than they receive in most other counties. In this way differences among counties are brought out by the productivity ratings.

The soil types are listed in the order of their general productivity under current practices instead of being placed in the order of their general inherent productivity, as it is believed that most people think of productivity in terms of current practices. It should be remembered, however, that the inherent productivity grade is an attempt to evaluate a more stable characteristic of the soil than may be true of productivity according to current practices of management. It is to be noted also that although the placement of soils into grades is an attempt to group the soils, a soil type whose weighted average places it in the lower part of a group may be more closely akin in productivity to the soil listed first in the following group than it is to the foremost members of its own group.

Productivity rating tables do not present the relative roles which soil types, because of their extent and the pattern of their distribution, play in the agriculture of a county. The tables give a quali-

tative characterization to the productivity of individual soil types in a county. They cannot picture the quantitative production of crops by soils without the additional knowledge of the acreage of the individual soil types devoted to the specified crops.

It must be stated clearly that these productivity ratings are not to be interpreted directly into specific land values. The table presented here is not based on enough of the factors which influence land values to warrant such an interpretation. The intention is to confine attention to the essentially permanent factors of inherent productivity and to the responsiveness of soils to fertilization and management, with little consideration given to the economic factors involved. In some instances the information on which to base the ratings is not so complete as desired; further study may suggest changes.

The following tabulation gives the more important crops of the county and the acre yield that has been set up as a standard of 100 for each crop. These yields have been selected to represent long-time production averages of the inherently most productive soils of significant acreage in the United States for products of satisfactory quality and are obtained without the use of soil amendments other than those produced directly or indirectly from the soil.

Crop:	*Bushels*	Crop:	*Tons*
Corn (grain)	50	Corn silage	12
Wheat	25	Timothy hay	2
Oats	50	Red clover	2
Beans	25	Alsike clover	2
Potatoes	200	Alfalfa	4½
Apples	200	Cabbage	12

	Cow-acre-days [1]
Pasture	100

[1] "Cow-acre-days" is a term used to express the carrying capacity of pasture land. It is the numerical equivalent of the number of animal units supported by 1 acre during a given number of days. Examples:
(*a*) A soil type supporting 1 animal unit per acre for 360 days would rate 360.
(*b*) A soil type supporting 1 animal unit per 2 acres for 360 days would rate 180.
(*c*) A soil type supporting 1 animal unit per 2 acres for 180 days would rate 90.
(*d*) A soil type supporting 1 animal unit per 4 acres for 160 days would rate 40.

SOILS AND THEIR INTERPRETATION

Soils of this county have developed under a mean annual temperature of 47.6° F., a normal annual precipitation of 32.83 inches, and a heavy forest vegetation. As these soil-forming influences are nearly uniform throughout the county, differences in soils are owing largely to the character of the parent material and to differences in relief.

The normal mature soil developed from the till of this region consists of brown or slightly reddish brown gravelly soil. Below a depth of 8 inches the color is lighter brown, free or nearly free of brown stains or gray mottling. At a normal depth of about 16 inches the texture becomes heavier, the structure more compact, and the subsoil more gravelly. Maximum heaviness and compaction are reached at a depth ranging from 20 to 30 inches, below which the very gravelly till is more friable. The surface soil has a pH value ranging from 6 to 7, at a depth of 15 inches the material is neutral or slightly alkaline, and the material below an average depth of about 24 inches is highly calcareous.

A profile of Ontario fine sandy loam as observed in an area near the junction of East River road and Maple Street shows the following layers, or horizons:

0 to 8 inches, dark slightly reddish brown fine sandy loam which is finely granular, friable, and contains a small quantity of sharp red sandstone gravel. The pH value is 7.

8 to 15 inches, slightly lighter brown less gravelly fine sandy loam. The pH value is 7.5.

15 to 18 inches, reddish-brown or slightly grayish brown compact gravelly clay loam. The pH value is 8.

18 to 36 inches, reddish-brown more compact gravelly clay loam.

36 inches +, till containing more sand and gravel. This material effervesces freely below a depth of 5 feet.

Over much of its area the nearly level lake plain has a covering of till modified in places by water action, and it is more or less stratified with rounded gravel and sand. On these low broad ridges and on parts of the more nearly level surrounding areas the soils belong to the Hilton series, in which a horizon of light-gray material, mottled with rusty brown, has developed in the upper part of the subsoil. Following is a description of the profile of a representative area as observed in an orchard near the Holt road north of the Shoemaker road:

0 to 6 inches, dark slightly reddish brown loam of light texture, with a finely granular structure, easily crumbled, and well filled with small tree roots. The pH value is 6.5.[7]

6 to 11 inches, light-brown or slightly yellowish brown loam which is light in texture, breaks when dry into irregular clods, ranging from one-fourth to three-fourths inch in diameter, but crumbles easily. Slight staining of rusty brown in the lower part. The pH value is 7.

These upper two layers contain a small quantity of sharp sandstone gravel and a very few rounded gravel.

11 to 16 inches, light-gray and rusty-brown faintly mottled light loam which crumbles easily. The pH value is 7.5.

16 to 24 inches, dull reddish-brown clay loam which is compact and when dry breaks into hard irregular-shaped clods ranging from 1 inch to 3 inches in diameter. Tree roots are abundant but small and crooked. The material in the lower part of the layer effervesces freely on application of acid.

24 to 48 inches, dull reddish-brown very compact sandy clay with some embedded sharp sandstone gravel. The structure is massive but in places shows thin laminations. Tree roots are very small and crooked.

48 to 60 inches, very gravelly more friable till.

In the more nearly level areas of the heavy-subsoil phases of the Hilton soils, the light-gray and mottled layer is more strongly developed.

Soils of the Dunkirk series have developed from water-laid materials in which very fine sand, silt, and clay have been deposited in thin layers on surfaces that have become well drained. An excavation in an orchard 2 miles northeast of Morton shows the following profile:

0 to 6 inches, brown or slightly grayish brown silt loam of light texture.

6 to 12 inches, light-brown smooth uniform silt loam.

12 to 32 inches, light-brown or grayish-brown silt loam including areas of lighter gray and small specks of rusty brown. The material is heavier in texture than that in the layer above, and the structure is massive.

[7] pH determinations were made in the field by the La Motte method.

32 to 60 inches, light-brown or olive-brown light silt loam or very fine sandy loam which is stratified in thin layers of slightly different texture.
60 to 86 inches, compact stratified very fine sandy loam.

Below this are thin layers of compact fine sand alternating with thin layers of Indian-red clay.

The pH value of this soil to a depth of 12 inches is about 7; from 24 to 36 inches, is 6 to 6.3; at 48 inches, is 7; and the material effervesces below a depth of 6 feet.

In the closely related soils of the Collamer series, developed in level areas, the light-gray and mottled layer in the upper part of the subsoil is more strongly developed.

Soils developed from parent material which contains a considerable quantity of lime are richer in lime in the surface soil and have a much heavier accumulation in the lower part of the subsoil. This is well shown in the Palmyra soils. Following is a description of a profile of Palmyra gravelly fine sandy loam as observed near the Henrietta-Rush Town Line road 2 miles northeast of Rush:

0 to 6 inches, dark grayish-brown gravelly fine sandy loam well filled with grass roots. The pH value is 7.3.
6 to 18 inches, yellowish-brown very gravelly fine sandy loam, the gravel being small and water-worn. The pH value is 7.
18 to 30 inches, dull reddish-brown somewhat compact gravelly loam. The lower part of this layer is very uneven. The pH value is 8+.
30 to 48 inches, light-gray sand and gravel in thin layers, some of which have white accumulations of lime and in places are weakly cemented.

The subsoil effervesces freely at a depth ranging from 18 to 24 inches.

The soils of the Alton series, developed from slightly less calcareous material, which are more deeply weathered on account of their coarser texture and more open structure, effervesce at an average depth of more than 30 inches.

Soils developed from heavy silt or clay are shallow. This is well shown in the heavy types of the Schoharie and Lucas series. Following is a description of a profile of typical Lucas silty clay loam, as observed near the Lake road in the northeastern corner of the county:

0 to 4 inches, dark grayish-brown heavy silt loam, in which the surface material is granular to a depth of 1 inch. Below this the structure is thinly laminated. The pH value is 7.3.
4 to 7 inches, dull pale yellowish-brown silt loam which is coarse granular in structure, and in which roots are very abundant. The pH value is 7.
7 to 11 inches, yellowish-brown, rusty-brown, and light-gray heavy silt loam with a small irregular cloddy structure, the clods ranging from one-fourth to three-fourths inch in diameter. The pH value is 6.8.
11 to 24 inches, dull slightly reddish brown or dark-brown clay which breaks into hard sharp clods ranging from one-half inch to 2 inches in diameter, and shows a trace of vertical cleavage. The pH value is 7.5.
24 to 32 inches, much the same material as in the layer above, but the clods are larger and slightly stratified with thin layers of yellowish brown. The pH value is 7.5.
32 to 48 inches, dull grayish-brown clay which breaks into large hard clods, ranging from 1 inch to 3 inches in diameter, coated with lime.
48 to 84 inches, dull olive-gray very tenacious clay. The material shows lines of stratification but does not break along these lines. It breaks into large somewhat regular blocks, and tree roots in places follow the cleavage planes and spread over the faces of the blocks. In places the cleavage is diagonal.

SUMMARY

Monroe County, situated on the shore of Lake Ontario, is one of the most important agricultural counties in the State of New York.

It occupies a position near the center of a very important fruit belt which extends along the lake shore from Oswego to Niagara Falls.

In addition to fruit growing, which is carried on principally near the lake, general farming and dairying are practiced to some extent in all parts but predominate in that part south of the ridge. Here large areas are devoted to wheat, oats, corn, grass, clover, and alfalfa, as well as to several crops of minor importance, as potatoes, cabbage, tomatoes, and various kinds of truck crops.

In 1935, this county had a larger acreage and production of wheat than any other county in the State and was one of the 10 leading counties in the production of potatoes.

Gardening and the growing of small fruits, flowers, and nursery stock are extensively carried on, and there are numerous greenhouses throughout the county.

Nearly 80 percent of the land is in farms, and the average size of farms is 66.3 acres, of which slightly more than 80 percent is classed as cropland and plowable pasture. In 1935, 77.8 percent of the farms were operated by owners, 20.8 percent by tenants, and 1.4 percent by managers.

There is a general recognition of the adaptability of soils to crops, and crop rotation is commonly practiced. On the whole, farm buildings are commodious and well kept, the farms present a good appearance, modern farm machinery is in general use, and all crops, livestock, and farm machinery are carefully housed.

The soils have been divided into 32 series, consisting of 65 soil types and 37 phases of types, in addition to 12 miscellaneous land types.

The soils have been placed, according to the source of material from which they have developed, in seven groups, as follows: (1) Brown and reddish-brown gravelly soils developed from glacial till; (2) light-brown, brown, and reddish-brown soils with stratified subsoils, developed from old lake and stream deposits; (3) brown and grayish-brown soils containing water-worn gravel and underlain by beds of sand and gravel; (4) dark-brown, brown, and dull-red soils underlain by rock beds at a slight depth; (5) dark-gray, dark-brown, dull-red, and reddish-brown soils in stream flood plains, consisting of recently deposited alluvium; (6) dark-gray and nearly black soils developed from miscellaneous materials, occupying small valleys and poorly drained basins; and (7) miscellaneous land types.

Of the first group, the Ontario soils are the most extensive and important, the Honeoye next, and the Hilton third. The Ontario and Honeoye soils occur principally south of the ridge and are used for general farming and dairying. The Hilton soils are most extensively developed north of the ridge, west of Genesee River, and are used extensively for apple orchards.

Of the second group, the Dunkirk and Berrien are the most important soils. They have developed principally north of the ridge and are used extensively for orchards.

Of the third group, the Alton and Palmyra are the more important soils. The Alton soils are developed along the ridge and used extensively for gardens and orchards, and the Palmyra are in the south-central part of the county, where they are used for general farming and especially for clover and alfalfa.

Soils of the fourth group are, as a rule, shallow and of rather low grade, although some areas of the Farmington and Brockport soils, where of sufficient depth, give fair returns of crops.

Of the fifth group, the Genesee soils, which are used for corn, small grains, and as grassland, are the most important.

Soils of the sixth group are low lying, dark colored, and poorly drained. In their present condition they are of little value except as grassland.

The seventh group includes materials which, with the exception of muck, have no agricultural value.

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