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PART 1

SOIL SURVEY OF WAYNE COUNTY, INDIANA

BY

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PART 2

THE MANAGEMENT OF WAYNE COUNTY SOILS

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PREFACE

This report consists of two parts. Part 1 is designed to be descriptive and in a measure a technical discussion of the soils. Part 2 is intended to furnish information about the treatment and management of the soils to county agents, farmers, and others interested in the use of the soils. The soil map serves both parts of the report.

PART 1. SOIL SURVEY OF WAYNE COUNTY, IND.

By T. M. BUSHNELL, in Charge, and F. E. BARNES, Purdue University Agricultural Experiment Station, and EARL D. FOWLER and JAMES THORP, U. S. Department of Agriculture

COUNTY SURVEYED

Wayne County is in the east-central part of Indiana. The Ohio State line forms its eastern boundary. Richmond, the county seat, is about 60 miles east of Indianapolis. The county is approximately square and includes an area of 405 square miles.

Physiographically this region is part of the till-plains section of the central lowland province of the great interior plains of the United States. Considered more in detail Wayne County is divided between the Tipton till plain in the north and the Dearborn upland in the south, but being on the boundary between the two it is not entirely typical of either division. The main local features are glacial uplands, extensive glacial river terraces or outwash plains, and recent-alluvial plains. The terraces and alluvial plains are narrow in the northern part of the county and widen as they converge in the southern part.

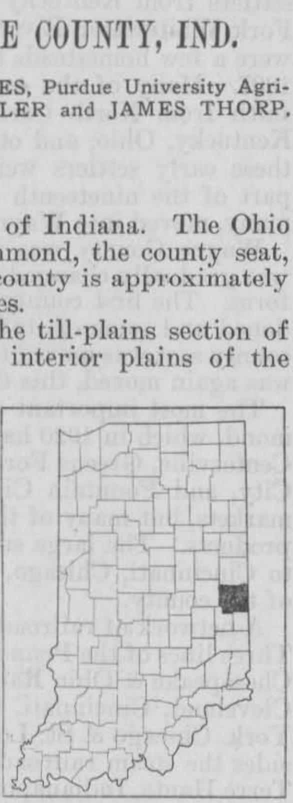


FIGURE 1.—Sketch map showing location of Wayne County, Ind.

In relief the uplands are plains. Main divides are rather flat or slightly undulating. Intervening shallow swales range in depth from a few inches to several feet. In places low swells or hills, with bowlder areas, are indicative of moraines. The Bloomington morainic system, called the outer border of the late Wisconsin glaciation, crosses the northern townships in a general east-west direction. As a terminal ridge it is not conspicuous, being broken by numerous large stream valleys extending north and south. The slopes from divides to bottoms, though irregular, are generally moderate and are cut by many short dry branches. The upper course of West Fork Whitewater River is bordered by steeper hills, and East Fork Whitewater River enters a deep, narrow gorge at Richmond and flows through a narrow bottom between rolling or steep and gullied hills to the southern boundary of the county. Near Richmond several abandoned valleys among irregular hills have smooth floors of bedrock, in which small stream valleys have been formed.

In Wayne County the maximum altitude above sea level is 1,250 feet and occurs along the northern border. The minimum altitude of 820 feet occurs where West Fork Whitewater River leaves the county. The average altitude is estimated at 1,035 feet. Valleys are, in general, shallow in the northern and more deeply intrenched in the southern part of the county.

The first settlement in Wayne County was made about 1805, when settlers from Kentucky and Pennsylvania took up land along East Fork Whitewater River near the present site of Richmond. There were a few homesteads along the banks of Elkhorn Creek as early as 1807. Many of the early settlers were immigrants of the Quaker faith from North Carolina. There were also many settlers from Kentucky, Ohio, and other States of the South and East. Most of these early settlers were of Anglo-Saxon ancestry. In the latter part of the nineteenth century many foreigners, mainly from Germany, moved into Wayne County.

Wayne County was formed from Dearborn County in 1810 and was gradually changed in shape and size until it attained its present form. The first county seat, which was called Salisbury, was abandoned and some of its buildings were moved to Richmond, and the county seat was moved to Centerville. At a later date the county seat was again moved, this time to Richmond, where it is now situated.

The most important city and local market of the county is Richmond, which in 1920 had a population of 26,765. Smaller towns are Centerville, Greens Fork, Dublin, Pershing, Hagerstown, Cambridge City, and Fountain City. These smaller towns are not important markets, but many of them serve as shipping points for agricultural products. The large surplus of farm crops and livestock is shipped to Cincinnati, Chicago, Indianapolis, and other cities east and west of the county.

A network of railroads very efficiently serves this part of the State. Three lines of the Pennsylvania system pass through Richmond. The Chesapeake & Ohio Railway also passes through Richmond, and the Cleveland, Cincinnati, Chicago & St. Louis Railway and the New York, Chicago & St. Louis Railroad serve parts of the county. Besides the steam railroads an excellent electric railway, known as the Terre Haute, Indianapolis & Eastern Railroad, carries passengers and freight between Terre Haute, Indianapolis, Richmond, and Dayton.

The county roads are almost without exception very good. Many are surfaced with gravel. The through roads, of which there are several, are made of concrete, macadam, or crushed rock and are always open to travel. The most important of the through roads are United States Highway No. 40, which crosses the county east to west through Richmond and Cambridge City, and United States Highway No. 27, which passes through Richmond, north to south.

At the present time more than three-fourths of the area of Wayne County is under cultivation. About one-tenth of the county is in woodland, including timbered hill pastures and farm wood lots. The timber growth includes oak, maple, hickory, and walnut on the better-drained lands, beech on the wet flats, and white elm, white ash, red oak, hickory, and similar trees on the low black land. Pin oak, sycamore, and willows also occur in lowlands and bottoms. Many species of bushes, such as sassafras, spicewood, and brier, are seen in the undergrowth. Some of the marshy swales were never timbered but were covered with sedges, rushes, and cattails.

CLIMATE

The climate of Wayne County is humid and temperate, with well-distributed rainfall. Weather Bureau data for precipitation, snowfall, temperatures, frosts, and growing season are given in Tables 1 and 2.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Cambridge City*

[Elevation, 941 feet]

Month	Temperature [1]			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year [*] (1914)	Total amount for the wettest year (1913)	Snow, average depth
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	29.7	69	−26	2.76	3.23	0.58	4.8
January	27.0	71	−26	3.28	1.53	8.30	7.0
February	26.6	70	−29	2.35	.53	1.80	4.9
Winter	27.8	71	−29	8.39	5.29	10.68	16.7
March	39.4	86	−1	4.30	1.90	11.80	2.6
April	49.5	90	19	3.82	3.58	4.61	.4
May	60.3	98	26	3.83	1.82	3.54	Trace.
Spring	49.7	98	−1	11.95	7.30	19.95	3.0
June	69.1	99	34	4.27	3.48	7.17	.0
July	73.5	106	42	3.57	1.75	6.71	.0
August	71.5	105	35	3.35	4.13	2.45	.0
Summer	71.4	106	34	11.19	9.36	16.33	.0
September	64.8	101	25	3.12	1.98	3.01	.0
October	52.8	91	13	2.81	1.64	2.94	.1
November	40.3	78	5	2.83	1.47	4.32	1.0
Fall	52.6	101	5	8.76	5.09	10.27	1.1
Year	50.4	106	−29	40.29	27.04	57.23	20.8

[1] Killing frost—average last in spring, May 2; average first in fall, Oct. 6; latest in spring, May 28; earliest in fall, Sept. 14.

TABLE 2.—*Normal monthly, seasonal, and annual temperature and precipitation at Richmond*

[Elevation, 972 feet]

Month	Temperature [1]			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1856)	Total amount for the wettest year (1855)	Snow, average depth
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	30.3	68	−24	2.99	3.29	4.05	4.0
January	27.0	72	−26	2.86	1.60	4.14	5.7
February	28.2	68	−27	2.45	1.78	1.32	3.9
Winter	28.5	72	−27	8.30	6.67	9.51	13.6
March	38.8	85	−7	3.79	.90	2.40	2.5
April	49.9	89	18	3.45	.56	2.18	.7
May	60.5	98	26	4.00	2.46	4.48	Trace.
Spring	49.7	98	−7	11.24	3.92	9.06	3.2
June	69.1	98	35	3.96	.54	8.46	.0
July	74.5	102	44	3.68	2.55	8.94	.0
August	70.9	100	41	3.89	1.70	5.00	.0
Summer	71.5	102	35	11.53	4.79	22.40	.0
September	65.0	98	28	3.29	2.46	8.06	.0
October	53.1	89	17	2.88	2.24	2.70	.1
November	40.7	86	0	3.14	3.24	5.04	1.0
Fall	52.9	98	0	9.31	7.94	15.80	1.1
Year	50.7	102	−27	40.38	23.32	56.77	17.9

[1] Killing frost—Average last in spring, May 4; average first in fall, Oct. 6; latest in spring, May 29; earliest in fall, Sept. 14.

SOILS

The soils of Wayne County have been classified on the basis of properties which could be determined in the field. Twenty-three soil types and three phases of types, together with three miscellaneous classes of material, muck, peat, and river wash, were recognized and mapped and are briefly described in the following pages. A more technical discussion, with greater emphasis on the characteristics and composition of the soil as a natural subject for purely scientific investigation is found in the chapter entitled, " Soils and their interpretation."

In the following pages the various soils are described in detail and their agricultural importance is discussed; the accompanying soil map shows their distribution; and Table 3 shows their acreage and proportionate extent.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Wayne County, Ind.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Miami silt loam	69, 056	32. 6	Homer silt loam	2, 176	0. 8
Slope phase	15, 488		Millsdale silt loam	896	. 3
Russell silt loam	5, 952	2. 3	Milton silt loam	1, 920	. 7
Bellefontaine silt loam	1, 728	. 7	Abington silt loam	6, 144	2. 4
Rodman gravelly loam	128	. 1	Abington silty clay loam	1, 472	. 6
Crosby silt loam	56, 768	21. 9	Westland silty clay loam	1, 344	. 5
Fincastle silt loam	512	. 2	Genesee silt loam	19, 648	7. 6
Bethel silt loam	3, 008	1. 2	Genesee loam	5, 824	2. 2
Brookston silty clay loam	18, 240	7. 0	Genesee fine sandy loam	2, 048	. 8
Clyde silty clay loam	576	. 2	Eel silt loam	2, 944	1. 1
Fairmount silty clay loam	1, 856	. 7	Muck	320	. 1
Fox silt loam	26, 816	14. 5	Peat	192	. 1
Deep phase	10, 560		River wash	384	. 1
Fox loam	1, 856	1 2			
Steep phase	1, 152		Total	259, 200	
Fox fine sandy loam	192	. 1			

MIAMI SILT LOAM

The detailed description of the profile of Miami silt loam is given in the chapter " Soils and their interpretation." In cultivated areas this soil consists of a layer of light-brown friable silt loam over light yellowish-brown friable silt loam which grades rather abruptly, at a depth of about 10 inches, into yellowish-brown silty clay loam. This becomes heavier and slightly darker in color downward, and a thin zone of dark-brown and rust-brown mottled sticky clay loam occurs at a depth of about 30 inches where there is an abrupt change to more friable, lighter-textured, light-yellowish, or grayish-brown gritty till containing about 5 per cent gravel and rocks more than 2 millimeters in diameter.

The upper layers tend to have a fine granular structure. The subsurface layer lacks definite arrangement. The heavier subsoil breaks into irregular angular fragments less than one-fourth inch in diameter, though the material may first fall into larger fragments by splitting along joint planes. The deeper subsoil lacks definite structure other than jointing.

The principal variation in Miami silt loam is toward a reddish subsoil color, similar to that of the Bellefontaine soils. These inclusions, however, lack the porous parent material layer of the Bellefontaine soils. In places the surface soil is unusually light textured, and elsewhere there are clay spots caused by the exposure of the heavy subsoil layer by erosion. In mapping, small spots of associated soils, such as members of the Crosby and Brookston series, may be included in areas of Miami silt loam.

This soil occurs in all parts of the county, especially around Richmond and north of Cambridge City. It occupies the smoother slopes of stream valleys, occurring in strips from a few rods to more than a mile in width. All the soil is arable. Surface drainage is naturally good. The subsoil, though heavy and not droughty, is pervious to air and moisture.

Miami silt loam is one of the better, more extensive, and important soils in Wayne County. Most of it is cleared of the original forest cover and has long been cultivated. It is used for corn, wheat, and hay. It is especially well adapted to wheat and is suited to orchard trees and alfalfa. The yields of crops and the valuation of this soil are above the average for upland soils.

Miami silt loam, slope phase.—This sloping soil is like typical Miami silt loam in soil characteristics, but the surface is more sloping and unfavorable for farming operations. The relief ranges from moderately steep to very steep and broken. Some areas are badly eroded. Areas of this phase of soil mapped on slopes also include spots which are really steep phases of other soils, such as Bellefontaine silt loam, Miami loam, and Fairmount silty clay loam.

Miami silt loam, slope phase, occurs wherever the typical soil occurs and is extensive north of Hagerstown and around Richmond. It lies between areas of Miami silt loam and bottom land.

This soil is comparatively unimportant in the county. A little of it is used for crops, mainly hay and wheat. More of the soil is used for pasture, and bluegrass is common on the cleared areas as well as in the more open woodland. The tree growth includes hard maple, oaks, walnut, hickory, and other hardwoods.

Crop yields on this phase of soil are somewhat poorer than on the typical soil. Soil washing is severe unless the land is protected by vegetation. The value of this soil depends on the relief, natural cover, and acreage found on any farm, and is estimated at from 25 to 75 per cent of the value of typical Miami silt loam. The map shows areas of Miami silt loam, slope phase, associated with Russell silt loam. Such areas really belong to the Russell series but because of their small extent and lack of agricultural significance they are included with this soil.

RUSSELL SILT LOAM

The surface soil of Russell silt loam consists of smooth, friable, light-brown silt loam 6 or 8 inches thick. This is underlain by light yellowish-brown silt loam, which very gradually passes into silty clay loam of the same color at a depth of 12 or 15 inches. The texture is increasingly heavy to a maximum depth of 25 or 30 inches, below which depth the materials become slightly lighter textured and more friable. This layer continues to a depth ranging from 40 to 50 inches, where in most places it becomes more gritty in texture and is tinged with rust brown. Throughout these layers the material is slightly or strongly acid in reaction. At a depth varying from 46 to 80 inches below the surface, carbonates occur in the subsoil, which remains rather yellowish in color. At a still greater depth the parent till material is more grayish and is higher in carbonates.

Russell silt loam resembles Miami silt loam superficially but is weathered more completely as is evidenced by: (1) Extra thickness of the layers; (2) approximately twice the depth to carbonates; (3) yellowish color of upper part of the parent material; (4) silty, rock-free texture to a depth of 3 or 4 feet; (5) less colloidal (sticky) subsoil; and (6) higher acidity, resulting from more thorough leaching out of bases. Also, there are fewer associated areas of dark-colored soil.

This soil occurs only in the southern part of Wayne County. The boundary between Russell silt loam and Miami silt loam south of Milton is rather abrupt and definite, but along Nolands Fork and near Abington it is not so well established. Russell silt loam is in general smoothly rolling and free from small draws. Drainage is good.

Russell silt loam comprises only a small part of the total area of Wayne County. However, it probably is one of the more important and extensive soils in a belt across south-central Indiana. Practically all of it is good agricultural land and is utilized for corn, wheat, hay, and clover for hog pasture. It is recognized as an unusually good soil for wheat. The yields of all crops are equal to those on Miami silt loam.

The value of this soil is $125 or more an acre. On some farms improvements are very good.

BELLEFONTAINE SILT LOAM

The surface soil of Bellefontaine silt loam consists of light-brown friable silt loam, 8 or 10 inches thick. This grades into light-yellowish or reddish-brown silty clay loam which becomes more reddish, darker, and heavier with depth. At a depth of 30 or 40 inches there is a thin transition zone of dark reddish-brown, sticky, gravelly clay, abruptly underlain by grayish, calcareous, cross-bedded gravel or light-textured till. As mapped this soil is a mixture of two soils, one resembling the Fox soils and the other a reddish variation of the Miami soils. These are combined because of their intricate intermingling and topographic unity.

Variations in this soil are due to inclusions of associated Miami soils, to textural differences, and to erosion. Included areas in the southwestern part of the county in association with Russell silt loam are weathered much deeper than is typical Bellefontaine silt loam. A dark-colored layer in the lower part of the subsoil is lacking in these areas.

Bellefontaine silt loam is mapped in several large areas northeast of Richmond and north of Cambridge City. Most of it is associated with old glacial drainage channels. Only a few small areas are in the upland till part of the county. The areas are irregularly rolling or hilly. The uneven surface probably resulted from construction by glacial action rather than subsequent erosion. This soil is not too rough for cultivation. Most of the steeper areas are mapped with the slope phase of Miami silt loam. Drainage is good, and some spots where gravel lies near the surface are even droughty.

Bellefontaine silt loam is not extensive in Wayne County. All of it is fairly good farm land. The crops usually grown are corn, wheat, mixed hay, and alfalfa, and hogs and dairy cattle are the most common livestock. Yields of crops, where the soil is not too rolling, compare well with those obtained on Miami silt loam. The soil commands about $100 an acre.

RODMAN GRAVELLY LOAM

Rodman gravelly loam consists of brown or rather dark-brown gravelly loam or silt loam grading, at a depth of 5 or 6 inches, into brown or slightly reddish-brown gravelly clay loam which is underlain, at a depth ranging from 15 to 25 inches, by grayish irregularly assorted and bedded calcareous gravel. Large, unweathered, rounded gravel occurs from the surface down. This soil grades into Bellefontaine silt loam.

The few areas of this soil mapped are northeast of Hagerstown and south of Hisers. They occur as small, eskerlike ridges rising above the stream terraces but lying within the valley. The relief is gently or steeply rolling. Surface drainage is good, and the coarse porous substratum makes underdrainage and aeration good or excessive. Erosion is likely to occur.

This soil is of little agricultural importance because of its small extent, stoniness, steepness, and droughtiness. Its value is less than that of associated soils. Its price depends on the acreage of it on any farm or on the possibility of opening gravel pits on it.

CROSBY SILT LOAM

The surface soil of Crosby silt loam consists of light brownish-gray or grayish-brown, friable, slightly gritty silt loam 6 or 8 inches thick. This grades into mottled very light-gray, yellow, and brown friable silt loam, which is underlain abruptly, at a depth ranging from 10 to 14 inches, by mottled yellow, brown, and gray heavy silty clay loam which, with increasing depth, becomes heavier and more gritty and contains a smaller proportion of light-gray material. At a depth of about 24 inches there is a very thin layer showing much darker shades of color. Below this the material abruptly becomes lighter textured and more friable and is yellow, brown, and gray highly calcareous glacial till. This till is very uniform to a depth of many feet and over miles of country.

There are three variations of Crosby silt loam, which are transitions into the associated soil types. The surface soil is more brownish and the subsurface soil less mottled with gray where this soil approaches Miami silt loam; the surface soil is more ash gray and the subsurface soil contains a larger proportion of gray where it approaches Bethel silt loam; and the surface soil is darker, deeper, and heavier adjacent to areas of Brookston silty clay loam. These variations occur as intricate mixtures of very small areas and can not be shown on a small-scale map.

Crosby silt loam is mapped in all parts of Wayne County, except the extreme southwestern corner. It occurs on the tops of the main divides, above the valley slopes which are dissected by small draws. It is intimately associated with Brookston silty clay loam, and the two are separated from the valleys by belts of well-drained Miami soils. The relief is normally rather flat or gently undulating. The variation resembling Miami silt loam may have a more uneven surface, and that resembling Bethel silt loam is more flat, but both are elevated or slightly convex. The variation resembling the Brookston soils tends to be depressed or concave, but all these variations may not locally vary more than a few inches in elevation from each other. However, there is a difference of several hundred feet in the general elevations of the areas of Crosby silt loam in different parts of the county.

Surface drainage of Crosby silt loam is fairly good, owing to run-off to adjacent low ground. The underdrainage, however, is rather poor, because the subsoil holds up moisture until the surface layers become saturated in wet weather. This tends to make the land somewhat cold and late.

Crosby silt loam is one of the most extensive soils in Wayne County, and is important agriculturally. Practically all of it is cleared and cultivated, except that in a few wood lots. Most of the woodland is located where conditions are unfavorable for bringing the soil under cultivation. Corn, wheat, mixed hay, and oats are the principal crops grown. Hogs are kept on most farms, and cattle are raised or fed in considerable numbers.

This soil is naturally not so suited to corn as Miami silt loam or the dark-colored soils. Corn makes a poorer start than on the dark-colored soils, and gives smaller yields of poorer quality grain unless the soil is well managed. On small spots scattered over many fields corn rarely matures. The average yield of corn is 30 bushels to the acre. On many farms the practice of putting all the available manure on the light ground has made yields on Crosby silt loam comparable to those on the Brookston soils. Wheat is second to corn in importance, and the soil is better suited to this crop. Small amounts of commercial fertilizers are commonly used. Yields average about 15 or 20 bushels to the acre. Mixed timothy and clover are the common hay crops. The timothy is apt to make a better stand than clover, which may be very thin in spots. Soybeans and sweetclover also make a spotted growth, although the fields as a whole may give fair yields.

The value of Crosby silt loam is a little below the average for the county. It is estimated to be about $100 an acre.

FINCASTLE SILT LOAM

The profile of Fincastle silt loam is described in detail in the chapter "Soils and their interpretation." This soil is much like Crosby silt loam in appearance, the upper soil layers consisting of light grayish-brown friable silt loam, grading into mottled light-gray, yellow, and brown silt loam which, in turn, grades into a heavier subsoil of much the same color. At a depth ranging from about 24 to 30 inches the subsoil attains its maximum heaviness and contains fewer grayish mottles. Below, the materials become a little lighter textured, more gritty, and less compact. Some dark iron stains and mottles are present. At a depth ranging from about 40 to 60 inches below the surface the material is calcareous glacial till. This becomes more grayish and higher in carbonates with depth. Fincastle silt loam differs from Crosby silt loam in being more free from gravel, in containing less clay in the heavy layer, in changing less abruptly from the surface to the subsoil layer, in lacking the dark lower subsoil layer, and in having a somewhat weathered calcareous layer at a greater depth below the surface.

Minor variations in Fincastle silt loam correspond to those in Crosby silt loam, but there is less included or associated dark-colored land in areas of Fincastle silt loam.

Fincastle silt loam occurs only in the southwestern part of Wayne County in association with Russell silt loam. It is of small extent but covers considerable areas in a belt across south-central Indiana. It occupies the smoother land back from the stream slopes. Surface drainage is fair, and underdrainage is imperfect owing to the tightness of the subsoil. The soil is utilized, handled, and cropped much as is Crosby silt loam, and yields and value are about the same for the two soils.

BETHEL SILT LOAM

Under cultivation the surface soil of Bethel silt loam, to a depth of 6 or 8 inches, consists of light-gray or brownish-gray friable silt loam containing some small gravel and iron concretions. The subsurface layer is also silt loam and is light gray or almost white, though soft iron aggregates in many places produce rust-brown stains. There is an abrupt change, at a depth of 10 or 12 inches, to heavy yellowish-brown and brown silty clay, in the upper part of which much of the light-gray silt from the subsurface layer has penetrated along the cleavage planes. The lower part contains less gray material and is more gravelly. At a depth ranging from 20 to 30 inches below the surface there is more or less dark-brown sticky clay in the cracks of the material. This thin zone is neutral, and the soil above it is moderately acid. Below the dark zone is more friable highly calcareous grayish till.

The principal variation in this soil approaches the mottled subsurface layer of the Crosby soils. In the woods, many observations reveal the presence of shallow Bethel silt loam surrounded by cultivated fields of Crosby silt loam. This indicates the close relationship between the two soils. Two small areas in the southwestern part of the county in association with Fincastle silt loam and Russell silt loam, and mapped as Bethel silt loam, are doubtless Delmar silt loam. They differ from Bethel silt loam in much the same way that Fincastle silt loam differs from Crosby silt loam. They are more deeply and more thoroughly weathered.

This soil occurs on the flattest parts of main divides remote from any stream ways. Most areas rise slightly and very gradually above intermingled areas of Brookston silty clay loam. Drainage is poor. The soil is utilized much as is Crosby silt loam. Some areas are slightly lower in agricultural value.

BROOKSTON SILTY CLAY LOAM

In cultivated areas Brookston silty clay loam, to a depth of 8 or 10 inches, consists of dark-brown or dark grayish-brown heavy silt loam or silty clay loam which grades downward to lighter-colored material and at a depth of 15 or 20 inches is slightly mottled with yellow and brown. Below this the dark shades due to humus fade out, and the material is bright mottled yellow, brown, and gray silty clay loam. From the surface through this layer, the soil is about neutral in reaction, but at a depth of about 40 or 50 inches it grades into calcareous till similar to the parent material of the Crosby and Miami soils. Many of the areas of Brookston silty clay loam in Wayne County are long, irregular streaks a few hundred feet wide and intertwined with areas of Crosby silt loam. In such areas the typical soil is commonly found near the outer borders or in the shallower parts of the depressions. Very commonly in the middles or deeper parts of these areas the soil is very similar to the Clyde soils. Here it tends to be deeper, darker, heavier textured, and more grayish. A layer below the surface soil and above the mottled yellow, brown, and gray subsoil is largely light gray and drab. It is impossible to separate these two variations which are both present in almost every small area, so they are combined in mapping.

A variation of Brookston silty clay loam occurs in many places along the borders of areas where light-colored silt has washed over the dark soil from the adjacent areas of Crosby and Miami soils. Mapped areas of Brookston silty clay loam also include small areas of dark soil associated with deeply weathered Russell silt loam and Fincastle silt loam. Here the soil is perhaps more grayish than in typical Brookston silty clay loam, and carbonates are not present to a depth of 80 or more inches in some places.

Brookston silty clay loam occurs in all parts of the county on the smoother parts of the divides. It forms a network through Crosby silt loam areas and in most fields covers less than one-third of the area. In some localities, as east of Boston, this soil constitutes the larger part of many 40-acre fields. Most areas of Brookston silty clay loam are smooth and flat, though a few are associated with the Miami soils in concave slopes cut by draws.

Surface drainage of this soil was naturally very poor, and water stood on the areas for months following rains. Now most of the land has been artificially drained by open ditches and tile, which remove the rainfall and the water which runs onto the areas from adjacent higher ground. Although this land has a heavy subsoil it tends to have a jointed structure and can be effectively tiled.

Brookston silty clay loam is an important soil because it is fairly extensive in Wayne County. It stands out from the associated light-colored soils as the best, strongest, and most productive soil on many farms. On only a small percentage of the land does any of the original timber cover of hardwoods, including oaks, hickory, and elm, remain.

Brookston silty clay loam is especially good cornland, and corn yields from 40 to 60 bushels to the acre on it in normal years. Well-drained areas also give very good yields of wheat and clover. Timothy, soybeans, and sweetclover also make a better growth than on lighter-colored land. The good yields naturally make the value of this soil somewhat above the average for the county.

CLYDE SILTY CLAY LOAM

Clyde silty clay loam, to a depth of 8 or 10 inches, consists of black or very dark-gray silty clay loam or silty clay. This grades into very dark-gray or drab silty clay which becomes lighter colored with depth until at a depth of about 20 inches it consists of light-gray silty clay slightly mottled with drab and rust brown. In places the dark surface material continues to a depth of 15 or 20 inches and grades rather abruptly into the light-gray layer. At a greater depth mottles of yellow and brown become more numerous, and calcareous till similar to that under the Brookston soils occurs at a still greater average depth. The principal variation in this soil is where it grades into Brookston silty clay loam. Patches too small to map occur in the centers of some areas of Brookston soils.

Clyde silty clay loam was mapped in a few areas scattered over the main divides. It occurs much like the Brookston soils but in the lower parts of depressions where water formerly stood throughout the year. Most of the areas have been effectively drained by ditches and tile. These flat areas of deep, dark-colored soil are now very good farm land. Like Brookston silty clay loam, this soil is good cornland and also gives good yields of the other important crops, where drainage is established. Most of the soil has been cleared of the original growth of elm, ash, oak, and hickory timber. It commands $125 or more an acre.

Table 4 shows the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil of Clyde silty clay loam.

TABLE 4.—*Mechanical analyses of Clyde silty clay loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
283772	Surface soil, 0 to 2 inches	0.8	4.4	5.0	10.6	9.6	14.6	55.3
283773	Subsurface soil, 3 to 6 inches	1.6	6.2	2.8	12.6	12.4	48.7	15.4
283774	Subsoil, 7 to 17 inches	1.2	4.6	3.5	13.4	14.8	50.7	12.3
283775	Subsoil, 18 to 34 inches	.8	3.2	2.8	12.4	18.0	52.8	10.5
283776	Subsoil, 35 to 54 inches	1.6	5.7	4.4	20.2	16.7	34.1	18.1
283777	Subsoil, 55 to 62+ inches	1.6	4.2	3.4	17.4	21.8	34.8	17.2

FAIRMOUNT SILTY CLAY LOAM

Fairmount silty clay loam is dark-brown silty clay loam, 5 or 6 inches thick, grading into brown, olive-brown, or yellowish silty clay loam or clay which becomes interbedded with hard, fossiliferous limestone and calcareous clays at a depth varying from 1 to 3 feet below the surface. Slabs of limestone are common on the surface of the soil. The variations in areas of this soil are chiefly minor inclusions of rough stony land, the slope phase of Miami silt loam, and Milton silt loam.

This soil occurs almost entirely along East Fork Whitewater River Valley below Richmond. It occupies the steeper valley slopes where glacial-drift materials have been eroded away, and the soil is residual from the bedrock of the region. The relief ranges from sloping to very rough. The areas include some broken and stony land and even a few rock cliffs such as those forming the walls of the gorge at Richmond. The run-off of rainfall is very rapid. A few springs are found on the hillsides or in gullies.

Fairmount silty clay loam probably supports a heavier timber growth than any other soil in the county. Although the larger trees have been cut there are some rather thick stands as well as scattered trees on the hillsides.

This soil, in many places in combination with small adjacent bottoms, is used chiefly as pasture for cattle, sheep, and hogs. Where the tree growth is not too thick there is a fine stand of bluegrass. Alfalfa and tobacco are grown on this soil type farther down East Fork Whitewater River Valley.

Because of its rough relief, Fairmount silty clay loam commands a low price.

FOX SILT LOAM

The cultivated surface soil of Fox silt loam, to a depth of about 8 inches, consists of brown friable silt loam, which grades into light-brown silt loam underlain, at a depth of 12 or 15 inches, by reddish-brown silty clay loam. This is underlain by more reddish, heavier, gritty clay loam which, like the layers above, is slightly acid in reaction. At a depth of 30 or 36 inches there is a thin layer of darker reddish-brown sticky clay loam, which is neutral in reaction. This gives way abruptly to grayish calcareous dry gravel.

The principal variations in Fox silt loam are slight textural differences and a range in the thickness of the layers, but as a whole this is a uniform soil.

Fox silt loam occurs along every large stream in the county, but the largest areas are along Martindale Creek and the lower part of West Fork Whitewater River. The soil occurs on terraces having dry gravel substrata. In many places these terraces occur in three successive steps or elevations above the first bottoms. Typically Fox silt loam occupies the middle step, Fox loam the lowest, and the deep phase of Fox silt loam the highest step. However, this relationship does not hold everywhere.

The surface of Fox silt loam is smooth, flat, and in a few places marked by draws or depressions. Most of the areas lie within valleys, although some of them are nearly as high as the uplands. Fox silt loam is naturally well drained by run-off to adjacent areas of the Genesee or Abington soils and through the underlying beds of gravel. Even small swales without surface outlets appear well drained.

Nearly all this soil has been cleared of the original timber, which consisted of walnut, hard maple, ash, oak, and similar trees. Old Indian villages and fields were located on the land, and the first white settlers found it so favorable to their use that they settled on it. Some fields have been cultivated many decades. It is an especially good wheat soil, and also gives very good yields of corn, clover, timothy, and soybeans. Where the gravel substratum lies near the surface, the crops may suffer a little from lack of moisture in times of drought.

Because of its general adaptability to crops and its favorable relief and high state of improvement, Fox silt loam is one of the most highly valued soils in Wayne County.

Fox silt loam, deep phase.—As mapped, Fox silt loam, deep phase, includes two distinct kinds of soil. One has a brownish surface soil and reddish-brown subsoil over gray calcareous gravel, like typical Fox silt loam, but the depth to gravel is greater. This is probably owing to the deeper weathering on the older, higher terraces where the deep phase commonly occurs. This more complete weathering makes the materials more silty and more free from gravel and produces a yellowish-brown silty upper subsoil layer. The other variety of land included in mapped areas of this soil is very similar in surface characteristics but the soil contains more or less glacial till and overlies gravel beds. Such land might be considered a smooth phase of Bellefontaine silt loam, but as it lies in a terrace position and is difficult to separate from the Fox soil derived entirely from gravel beds, it has been included in mapping.

This deep soil occurs in a few areas along the stream valleys in association with typical Fox silt loam. In many places the two soils are separated on higher and lower benches by a steep bank from 5 to 15 feet high, but in places they grade into each other.

Areas of this soil are generally smooth, though some are gently undulating or sloping. Areas may be cut by draws or ditches leading from the hills to the first bottoms. Very good drainage is afforded by surface run-off to low land and by percolation through the underlying gravel. The thick layers of weathered soil keep this land from becoming droughty and may even tend to check moisture movement in areas where this soil grades toward Homer silt loam.

The utilization and value of the deep phase of Fox silt loam are much like those of the typical soil.

Table 5 shows the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil of typical Fox silt loam.

TABLE 5.—*Mechanical analyses of Fox silt loam*

No	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
283734 283735	Surface soil, 0 to 3 inches	0.6	4.0	4.2	21.0	14.6	45.1	11.0
283736	Subsurface soil, 4 to 13 inches	.3	3.2	3.6	18.8	16.4	44.3	13.6
283737	Subsoil, 14 to 16 inches	.7	3.8	4.2	22.0	15.0	34.6	19.5
283740	Subsoil, 33 to 60+inches	9.0	23.8	10.5	15.0	13.8	22.9	5.3

FOX LOAM

Fox loam consists of a layer of brown or dark-brown loam or gravelly loam, 6 or 8 inches thick, grading into reddish-brown gritty clay loam, which overlies gray calcareous gravel at a depth of about 30 inches below the surface. The principal variations are in texture, completeness of weathering, and thickness of the layers.

Fox loam is associated with Fox silt loam in a few areas, the largest of which are north and south of Sacket Lake. It occurs on low terraces a few feet higher than the areas of the Genesee soils and in most places is separated by a sharp rise, a few feet high, from higher areas of Fox silt loam. The surface of the land is level, though there may be slight local unevenness.

Fox loam is utilized much as is Fox silt loam, and yields of the main crops are about the same on the two soils. Because this soil is more shallow, it is a little more droughty than the silt loam, and some spots are not so good because of the quantity of gravel in the surface soil. Its value is a little lower than that of Fox silt loam.

Fox loam, steep phase.—The steep phase of Fox loam was separated on the basis of relief and includes steep slopes of Fox soils. Some of the slopes are from 5 to 20 feet high and very steep. Their width had to be exaggerated to show them on the map. Others are smoother and wider and find some use for wheat, pasture, or hay land. Erosion is serious, and crop yields are not large. A little of the land is in timber.

FOX FINE SANDY LOAM

Fox fine sandy loam, to a depth of about 8 inches, consists of brown fine sandy loam or gritty loam which grades through yellowish-brown fine sandy loam into reddish-brown heavy loam or sandy clay loam. Below a depth of about 3 feet the material is somewhat more friable. Lime is not found within 5 feet of the surface. This soil differs from other members of the Fox series in its greater depth, greater acidity of all layers, and lack of a dark lower subsoil layer and calcareous gravel immediately beneath it. It is the lightest-textured soil in the county, except in the first bottoms, and the source of the sandy material is unknown.

Practically all areas of this soil are mapped east of Nolands Fork about 5 miles southwest of Centerville. The soil occurs on flat or slightly sloping areas on the terraces. A long strip lies at the foot of an upland. Others are on rises above adjoining terrace soils. Drainage is good.

Fox fine sandy loam is of minor importance because of its small extent, but it is under cultivation to the common crops and produces good yields. It is valued at about the same figure as Fox loam.

HOMER SILT LOAM

The surface soil of Homer silt loam consists of grayish-brown or light-gray friable silt loam, 6 or 8 inches thick. This grades into mottled gray, yellow, and brown or light-gray silt loam, which is underlain at a depth of 10 or 12 inches by a much heavier subsoil of about the same color. At a depth of about 2½ feet darker shades of color are present in many places, and below this depth is heavy, smooth, calcareous clay. At a still greater depth stratified sand and gravel are found. In some places the dark layer is underlain by one containing white silty streaks, gray clay, and large gravel over earthy, calcareous, water-bearing gravel.

This soil is variable, including soils comparable in the surface layers to both Crosby silt loam and Bethel silt loam. The parent water-laid deposits are not uniform. Where the soil approaches the Fox soils it may be slightly reddish in the heavy subsoil but the subsurface soil is mottled with gray. Small spots of the Fox, Westland, and Abington soils were included in mapping.

Areas of Homer silt loam are on the large terraces in association with the Fox soils. The largest areas are near Hisers and northeast of Centerville. Areas are flat and are commonly a little lower than areas of Fox silt loam but higher than those of the Westland or Abington soils. The surface is very smooth, but the run-off is fair. The heavy subsoil hinders underdrainage, as in Crosby silt loam.

Homer silt loam is of small extent in Wayne County. It is farmed to corn, wheat, and hay, and the yields are estimated to be a little better than on Crosby silt loam.

MILLSDALE SILT LOAM

Millsdale silt loam has a very dark-brown surface soil, which is underlain by somewhat lighter-colored material, speckled or mottled with yellow and brown, at a depth of about 15 inches. In places gray or light-gray materials are also plentiful in the mottled layer. At a depth ranging from 18 to 30 inches below the surface is solid limestone rock. Light-gray, olive, or yellow residual clay may also occur over the rock or interbedded with the first loose slabs, but in places glacial drift material can be identified in the upper soil. Because of its small extent this soil was mapped in Wayne County to include all dark-colored soil similar in surface soil to both Brookston and Clyde material, and in which rock lay at a slight depth.

Millsdale silt loam occurs in the southeastern part of the county in old stream valleys or terracelike positions. The surface is rather flat or depressed in most places, although some areas lie on slopes below outcrops of residual material. Drainage was naturally poor, but in most places it has been easy to drain areas by small ditches to near-by streams.

Millsdale silt loam is an unimportant soil in Wayne County. In productiveness it compares well with Brookston silty clay loam, except where the bedrock is too near the surface.

MILTON SILT LOAM

Milton silt loam consists of light-brown silt loam about 8 inches thick over light yellowish-brown silt loam which grades into silty clay loam resting on limestone rock at a slight depth. On account of its small extent, this soil as mapped in Wayne County also includes areas equivalent to Crosby silt loam over rock. As the thickness of soil materials varies greatly locally, rock may be found at a depth varying from 1 to 5 feet. In some places this soil may include some small areas of the deep phase of Fox silt loam.

This soil occurs only in the vicinity of the old valleys in the southeastern part of the county, in association with Millsdale silt loam. It occupies terracelike flats and undulating or rolling hillsides. On all but the flattest areas natural drainage is good, except where the bedrock holds up the moisture locally. It is very good wheatland but is not so good for corn as the darker soils. The crop yields and value of this soil probably average a little below those of Miami silt loam.

ABINGTON SILT LOAM

Abington silt loam has a dark-colored silt loam surface soil, ranging from black to dark gray or dark brown, which grades downward into a subsoil which is lighter in color and mottled with light gray and some rust brown. This rests on water-bearing, stratified gravel.

This soil is mapped along most of the larger stream valleys, where it occurs on the lower parts of the terraces and on the overflow bottoms. On the bottoms it is evident that the soil material was accumulated in the lowest part of the old glacial drainage channels and that deposition by the comparatively small modern streams has not been able to cover all of the old Abington soil areas with the fresh brown Genesee soils.

As the surface of Abington silt loam is depressed and the elevation is less than that of adjoining land, artificial ditching and dredging of creek channels have been necessary to drain these areas. Very few of the areas become too wet for crops at the present time.

Abington silt loam is one of the better corn soils of the county and is used for that crop more often than the light-colored soils. Yields range from 40 to 60 or more bushels to the acre. There is more danger from frosts on this soil than on higher ground. On well-drained areas wheat and clover also make excellent yields.

ABINGTON SILTY CLAY LOAM

The surface soil of Abington silty clay loam consists of black or dark-gray heavy silty clay loam. This grades, at a depth varying from 15 to 20 inches, into lighter-gray or drab silty clay containing some rust-brown and yellowish stains. In most places at a depth of $2\frac{1}{2}$ or 3 feet below the surface coarse gravel in an earthy matrix is present. On the surface of much of the gravel is a whitish coating of silty material. Below this are beds of earthy calcareous gravel, which were formerly saturated with water.

Abington silty clay loam occurs in a few areas in the main valleys of the county, where it occupies the lowest parts of the second bottoms. These depressions were normally poorly drained land, but the water table has been lowered several feet below the surface by ditches and tile drains. Agriculturally this soil is much like Abington silt loam, but it is heavier and more sticky and does not occur at first-bottom levels.

WESTLAND SILTY CLAY LOAM

The surface soil of Westland silty clay loam consists of dark-brown silt loam or silty clay loam, 6 or 8 inches thick. The material below this becomes lighter colored with depth and speckled or mottled with yellow, brown, and gray at a depth of 15 or 20 inches below the surface. This grades into smooth, laminated clay, mottled yellow, brown, and gray, which contains carbonates at a depth of about $3\frac{1}{2}$ feet below the surface. At a greater depth there may be stratified sands, silts, and gravels.

The variations in this soil, as mapped, are due to inclusions of associated soils, to transitions, and to the variety of textures in the substratum.

This soil occurs on the terraces of the larger streams, chiefly along Nolands Fork. It occupies rather flat areas slightly lower than the Homer or Fox soils but higher than the Abington soil. Natural drainage was imperfect, but the drainage has been much improved by ditches and tile.

Although this soil is of small total extent, it is the best soil on some farms and gives satisfactory yields of the common crops. It is a very good corn soil and produces as well as Brookston silty clay loam, which it resembles in appearance and value.

GENESEE SILT LOAM

The surface soil of Genesee silt loam consists of brown friable silt loam, which may continue to a considerable depth without much change. However, since this is an alluvial soil, the lower layers may show buried soils of varied texture and shades of brown. In Wayne County many areas are well drained and are above normal stream level. Such areas have a yellowish-brown cast in the subsoil, suggestive of incipient weathering.

Genesee silt loam is the most extensive alluvial soil in the county and occurs in the first bottoms of almost every stream. The surface is level and smooth, except where it is broken by abandoned stream channels. Drainage is normally good, although the land is subject to overflow after heavy rains. Flood waters do not stay on the land very long. Drainage has been improved by ditching the creeks to give a deeper and more direct outlet.

Genesee silt loam is a strong, productive soil especially suited to corn, which is grown on it year after year without decline in yields. It is not so good for wheat, because of danger of flooding and because the grain does not fill in proportion to the growth of straw. Hay and pasture crops do very well. Some of this soil lies in such small, irregular strips and is so cut by stream channels that it is best adapted to use as pasture or wood lots. Scattered trees, some of which are large sycamores, are common. Killing frosts occur earlier on this soil than on the terraces or uplands.

GENESEE LOAM

Genesee loam consists of brown loam over brownish layers of varying texture. Like all the Genesee soils, this is a first-bottom soil, was originally timbered, and is sweet, productive farm land. It differs from Genesee silt loam chiefly in texture and in that the floods which deposited the soil materials and which still sweep over the land periodically have swifter currents than on that soil. Genesee loam occurs in strips nearer the stream channels than does Genesee silt loam. In agricultural usage and value the two soils are very similar.

GENESEE FINE SANDY LOAM

All the brown first-bottom lands which are more sandy in texture than loamy are mapped as Genesee fine sandy loam. This soil occurs along the banks of streams where the swiftest currents spread out and drop their sediments during flood times. In these places much of the soil may be washed away in one freshet and thick deposits laid down by the next one. The surface of the land is in many places ridged or billowy owing to this water action.

Some of the Genesee fine sandy loam is fairly good farm land and is devoted to corn, but on the average this soil is not so good for farming purposes as Genesee silt loam. On much of it a fringe of trees helps protect the bottoms against destructive overflows and affords some firewood. This soil is commonly pastured.

EEL SILT LOAM

Typically Eel silt loam, to a depth of 8 or 10 inches, consists of brown or grayish-brown friable silt loam underlain by mottled gray and brown silt loam or loam. The substratum is mottled, wet alluvium. The materials are neutral in reaction. One important variation is found along the small, seepy bottoms near the headwaters of local streams, where the alluvium and Clyde soils grade into each other. Here the surface soil is darker than typical. In a few places rock layers at a slight depth under the bottoms help produce the poor drainage typical of Eel silt loam.

Eel silt loam occurs along a number of small streams in almost all parts of the county. The surface is rather flat, except for shallow abandoned channels. The bottoms lie only 1 or 2 feet above the normal stream levels, and the subsoil is kept saturated by the stream or by seepage from hillside springs. It is only with great difficulty that some of the areas are thoroughly drained. A few areas have been devoted to corn, but in Wayne County this soil is better suited to and more extensively used as pasture and hay land.

MUCK

Muck consists of loose, black, well-decomposed vegetable matter a foot or more thick, underlain by very dark-brown, loose, somewhat fibrous material. At a greater depth there is an admixture of more mineral matter, such as silt, clay, shells, and marl in varying proportions. At a depth ranging from 2 to 5 feet below the surface there are purely mineral layers of calcareous materials. In some timbered areas the surface soil contains some black, granular, woody fragments.

Muck occurs in a few small areas in deep pockets in the terraces. Some of these were marshy ponds, with grass and cattail vegetation. Others were covered with ash, swamp maple, bushes, and similar vegetation.

Drainage was naturally poor, because of the depressed location and in some places because the basins were watered by springs. Most areas have been well drained by ditches and are used for bluegrass pasture or the production of corn, which is grown several years in succession. Muck contains considerable mineral matter and makes rather firm, productive farm land. It is not acid in reaction.

PEAT

Peat consists of dark-brown slightly fibrous organic soil which becomes more brownish and fibrous with depth. In many places the lower layers have a fresh, olive color and contain well-preserved seed coats and other plant structures. Several feet below the surface there is a greater admixture of grayish mineral matter, and the material rests on stratified, water-soaked clay, sand, or other material. The natural vegetation is of cattails, reeds, saw grass, and a few willows.

In a typical area in Sacket Lake, the material is somewhat acid in reaction.

Peat is mapped in old pond bottoms found mostly in pronounced depressions on the old glacial valleys. The drainage was naturally very poor, because the ponds had no outlets, and some of the ponds are difficult to drain. Some are fed by springs. The characteristic brown fibrous appearance of peat is best preserved in the wettest areas. Under good drainage the material takes on a black, well-decomposed appearance indicating a change toward muck. One extreme is found in Sacket Lake where an effort has been made to keep the area as a duck pond, and other areas are being brought under cultivation and are giving fair yields of corn.

RIVER WASH

River wash consists of the sandy, gravelly, and stony deposits in the channels or on the immediate banks of the larger streams of the county. The fine earth has been washed out of these sand and gravel bars, which support little vegetation other than scattered weeds, willows, and poplars. Such land has practically no agricultural value, but it furnishes gravel for roads or construction purposes in places.

AGRICULTURE

Since the eighteenth century, when Wayne County was an unbroken forest, local agriculture has passed through the transitions common in the region. After a period of isolated, self-sufficient pioneer farms, the land was rapidly settled. Much of the timber was cut to make room for fields before lumber was really valuable. The naturally better-drained land was first utilized, and some fields have been cropped for more than a century. With the growth of population and the advent of railroads, farming became a business, with commodities exported and imported. Artificial drainage transformed the wetter lands into some of the strongest and most productive soils. Recently hard roads and autos have connected farms more closely with the markets of the world.

Census data from 1880 to 1920, inclusive, indicate many changes. There has been a slight decrease in the number of farms and a slight increase in their average size and in the percentage of improved land. Land values tripled in 20 years before 1920, but have dropped sharply since that time. The total value of all crops, which tripled in only 10 years, also decreased greatly between 1919 and 1924. These changes are, perhaps, owing more to price variations than to differences in production, but both acreage and total yields of corn and wheat were much lower in 1924 than in 1919.

The cost of hired farm labor doubled between 1910 and 1920. In the same period the number of farmers buying feed doubled, and the average feed bill became five times as large. The average amount spent for fertilizer nearly tripled, and the number of farmers reporting its use increased nearly one-half.

Farm tenancy has gradually increased, but 64.5 per cent of the farms were operated by owners in 1920.

Although urban population has more than doubled and is still increasing, rural population slowly decreased to 21,371 in 1920. This was 44.4 per cent of the total.

Table 6, based on census figures, shows land and farm areas in 1920.

TABLE 6.—*Land and farm areas in 1920*

Total farms	Area in farms		Improved land	
	In farms	Per farm	In farms	Per farm
Number	*Per cent*	*Acres*	*Per cent*	*Acres*
2,410	92.7	101.2	81.1	82.0

According to the census, the value of agricultural products in 1919 was as follows:

Cereals	$6,021,507
Other grains and seeds	28,294
Hay and forage	800,374
Vegetables	236,290
Fruits and nuts	45,782
All other crops	21,243
Value of all domestic animals	3,705,922
Dairy products, excluding home use	481,987
Poultry and eggs	642,806
Wool	27,745
Total	12,011,950

In spite of changes in annual acreage, the relative positions of the important crops have remained unchanged for half a century. Recent decades have brought expansion in hog raising as well as dairying and poultry raising.

In Wayne County about two-fifths of the farmed land is devoted to corn, much of which is fed to hogs. Wheat is a cash crop sown on about one-third of the cropped land each year. About one-eighth of the land is in hay, chiefly timothy and clover. The remaining one-seventh of the farm land is used for pasture, oats, alfalfa, soybeans, sweetclover, and other minor crops.

Corn is usually grown on meadow or pasture land, though it may follow corn or small grain. The land is broken, in the fall or spring, and is thoroughly pulverized. The corn planted in drills or checkrows is clean cultivated until it is laid by, and is harvested by husking from the row or shock or by cutting for silage. Some is hogged down.

Much of the wheat is seeded in standing corn with 1-horse drills, though it may be sown on corn-shock ground or may follow small grain. It is usually sold at harvest time.

Timothy and clover, either alone or together, are usually seeded on wheat or oat land, and when a good stand is obtained are cut for hay for one or more years. A considerable acreage of clover is not cut for hay but is used for pasturage for hogs or other livestock. There are some permanent bluegrass pastures, and livestock is also turned out on stubble, cornstalks, woods, and roadsides.

Most Wayne County farms are well improved in respect to drainage, fences, and barns and other outbuildings, and are well stocked with farm animals and machinery. There are many large brick farmhouses belonging to a past generation, and numerous modern frame dwellings. With good systems of telephone, rural-mail delivery, rural schools, hard-surfaced roads, and many modern conveniences, the average farm home is a good place to live.

It is obvious that average soil conditions have been a factor in fixing the average type of farming in Wayne County and also that location of soils in reference to markets affects their use, especially for dairying and trucking.

Such factors as relief of different soils and relative proportions of soils may cause the utilization of individual farms to vary widely from the average. Hilly, broken land or bottoms which are irregular or subject to overflow serve as pastures and permanent wood lots. On many farms fields of irregular shape laid out along natural soil and topographic boundaries are adapted to peculiar or limited uses.

Under rotation systems practically all the common crops are grown on all types of soil, but the acreage production depends largely on the soil. For instance, in 1923 corn on a certain farm yielded about 60 bushels to the acre on Genesee silt loam, Fox silt loam, and Brookston silty clay loam, and a little less on well-manured Miami silt loam. In the same fields it yielded only 40 bushels to the acre of inferior corn on Crosby silt loam and Bethel silt loam.

Some of the bottom lands and black lands will stand heavy cropping and are used for corn several years in succession. On the lighter-colored upland soils corn, clover, and soybeans do not do so well, but wheat may be even more successful than on darker, poorly drained lands. The Fox, Bellefontaine, and Miami soils are generally preferred for alfalfa.

Most of the soils of Wayne County are silt loams of adequate water-holding capacity. The natural surface drainage of the lighter-colored soils is commonly good. However, the Crosby, Homer, and Bethel soils have tight subsoils which retard the movement of moisture and air. The subsoils hold up the water and tend to keep the surface soil saturated during the rainy seasons, yet allow the surface to become too dry in dry weather. Where this condition exists under roadbeds, soft spots and small depressions often form in the spring.

The Fox and Bellefontaine soils with gravel substrata may become a little droughty. In few places are they artificially drained. Dark-colored, depressed silty clay loams are very drought resistant. In dry weather the dark land is more moist and more easy to break than the dry, hard, light-colored land. In rainy springs water may stand more or less on dark land and make small grain look paler green than on higher, light-colored areas.

Soils with heavy subsoils are tiled to some extent. Tile will draw effectively about 3 rods in dark-colored land and about 2 rods in light-colored land. Outlets are provided by large tile which are laid along swales through dark land. Large outlets have been made by ditches through areas of the Brookston and Abington soils and by straightening stream courses through Genesee bottom-land areas.

Small hillside draws carry the run-off from the Miami soils, but tile are often laid to prevent washing.

In general, the Genesee soils are not fertilized, except by natural deposits of sediment during overflows. The Brookston, Clyde, Abington, and Westland soils are not fertilized so much on their own account but because they are mixed with poorer soils, and farmers apply fertilizers to a field as a whole. Sometimes manure is applied only on the thinner, lighter-colored spots in fields.

Soils have not been extensively limed in Wayne County. Limestone has been applied where clover did not do well and where tests showed the soil to be acid. As a rule this is on the lighter-colored soils. Land for alfalfa has been limed, even though the soil was not very acid.

SOILS AND THEIR INTERPRETATION

Direct observation of soils reveals that they consist of more or less distinct and horizontal layers which may be ascribed to the action of weathering or life processes. These layers include the whole of the true soil and distinguish it from the underlying, unconsolidated mantle rock which lacks layers although it may contain strata caused by geologic processes of deposition or even buried soils which are now separated from the surface by overlying geologic layers. A vertical section of these layers may be called the soil profile.

The soil profile discloses the features by which soils may be identified and classified. The layers in any given soil may differ much from each other in character or may change rapidly in a vertical direction, but they preserve comparative uniformity of thickness and composition in a horizontal direction. On slopes the layers are parallel to the surface rather than horizontal. The things which are usually noted in a soil profile are the number, color, texture, structure, thickness, relative arrangement, and chemical composition of the various layers, the thickness of the true soil, and the character and geology of the parent material. The substratum also is of importance, because it commonly functions with the soil, especially in soil-moisture relations.

In Wayne County 29 separations were made on the soil map. Three of these were based on characteristics other than soil character alone, such as topographic phases. Eighteen distinctly different soil profiles were recognized. These varied from each other in the number, relationships, and nature of their layers in ways which could be determined by field examination. These soil types may be naturally grouped into 2 organic soils and 18 soil series. In addition river wash, a miscellaneous class of material, is mapped.

All the soils in a series have practically the same profile but differ from each other chiefly in texture and thickness of the layers, especially the upper layers. In places one or more layers which are normal to a series may be incipient or rudimentary in one of the soils which apparently lacks the layer.

The virgin soils of the 18 soil series found in Wayne County showed from 3 to 7 distinct layers in the true soil profile besides from 1 to 3 variations in the parent materials or underlying strata.

In cultivated lands the number of layers is usually reduced by 1 or 2 through the mixing of 2 or 3 surface layers or possibly the removal of some layers by erosion.

Consideration of the 18 distinct profiles discloses simple relationships by which the soils may be grouped into three main divisions or groups, in two of which the minor layers of the true soil may be indicated as parts of two main layers. In the first group, the profiles show an upper eluviated layer, which has lost by chemical and physical action, and a lower illuviated layer, which has apparently gained from layers above, over an underlying parent material from which the true soil was formed.

The second group of soils does not show the features of the first group though it has the same number of major layers or horizons. The surface layer is marked by more or less accumulation and preservation of organic matter or humus. The second layer is comparatively poor in organic matter and consists of accumulated or modified mineral matter. The next lower layer may be parent material from which overlying layers are in part derived or it may be merely the unrelated substratum beneath the soil.

A third group consists of soils derived from or consisting of recent alluvium. These soils do not show definite weathered layers or humus accumulation in the surface soil but are made up of depositional layers.

The following descriptions of the soil series of the first group are based on the characteristics of the undisturbed soils.

Soils of the Miami series have well-developed soil layers, the true soil averaging 30 inches in thickness. They have developed on well-drained, light-colored, timbered uplands, where the parent material was calcareous glacial drift. The silt loam and its slope phase were mapped in Wayne County. The following is a description of the layers in a virgin profile of the series: (1) Dark-brown or grayish-brown soil, 1 or 2 inches thick, containing considerable humus and many rootlets and having a soft, crumb structure; (2) light-brown friable soil, from 2 to 4 inches thick, containing some humus; (3) light-brown, yellowish-brown, or slightly reddish-brown friable soil, from 3 to 5 inches thick, which becomes slightly heavier with depth; (4) material similar to that of layer 3 but heavier and breaking into small subangular fragments, the surfaces of which may have a faint gray coating; (5) light-brown, yellowish-brown, or slightly reddish-brown heavier material containing more clay and some hard, angular rock fragments such as exist in smaller numbers in the upper layers; (6) a very thin, dark, plastic layer, neutral in reaction; (7) the parent material, which contains an abundance of lime carbonate and is alkaline in reaction. In the upper part it may be more or less modified, being mottled with shades of brown and containing many angular, partly weathered glacial rocks, such as dolomite, limestone, granites, gneisses, schists, and diorite. The lower part is unmodified till, in most places light yellow and gray in color and heavy in texture. The five upper layers contain no carbonates but are slightly acid in reaction.

Table 7 shows the results of mechanical analyses of the various layers of Miami silt loam.

TABLE 7.—*Mechanical analyses of Miami silt loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
[1] 283701	Surface soil, 0 to 2 inches	0.6	1.0	1.2	8.0	8.4	18.3	62.3
283702	Subsurface soil, 3 to 5 inches	1.6	3.8	3.0	18.0	17.9	44.8	10.9
283703	Subsurface soil, 6 to 9 inches	.9	3.2	3.2	19.2	19.6	40.9	13.1
283704	Subsoil, 10 to 15 inches	.6	2.9	2.8	16.6	17.5	36.3	23.4
283705	Subsoil, 16 to 30 inches	.8	3.6	3.7	20.0	14.8	25.5	31.2
283706	Subsoil, 31 to 42 inches	1.4	5.8	5.8	25.8	14.7	28.4	18.5
283707	Subsoil, 43 to 60 inches	4.8	9.2	5.2	22.6	18.0	29.3	11.5

[1] The high content of clay indicated in this sample is due to the large amount of finely divided organic matter present.

The Russell soils, like the Miami, have developed from glacial till on well-drained, timbered uplands but are weathered about twice as deep as the Miami soils. They are more silty, less plastic, more yellowish, thicker layered, and more acid than the Miami soils and lack the dark neutral layer just above the parent material. The profile of the Russell series shows the following distinct soil layers: (1) Dark grayish-brown friable soil, typically silt loam, 1 or 2 inches thick; (2) light-grayish or yellowish-brown friable soil, typically silt loam containing some humus, showing a tendency toward a laminated structure, and 3 or 4 inches thick; (3) light brownish-yellow or yellowish-brown, silty friable soil, 8 or 10 inches thick; (4) a gradual transition from the upper silty layers to light yellowish-brown heavier soil, 6 or 8 inches thick; (5) a 10-inch layer of yellowish-brown silty clay loam, the heaviest-textured layer in the soil, which crumbles readily to angular fragments from one-sixteenth to one-fourth inch in diameter; (6) somewhat variegated but not definitely mottled yellowish-brown silty clay loam or silt loam, slightly less heavy and more friable than the layer above and not showing the definite granular structure of that layer; (7) material similar to that just above it but more gritty and with a rather intense color suggestive of reddish hues; (8) silty or gritty clay loam, more yellowish than the material just above and containing free lime carbonate; (9) less-weathered parent material (early Wisconsin till), more grayish in color, higher in carbonates, and containing more rock than layer No. 8. Under cultivation the upper layers are mixed so that there is a layer, extending to plow depth, which contains humus, and a subsurface layer without visible humus coloration. The eluviated layers total about 1 foot in thickness. The first seven layers in this soil are acid, the maximum acidity occurring in layer 5.

The Milton series includes well-drained, light-colored, timbered lands in terracelike situations, resting on bedrock at a depth ranging from 1 to 4 feet below the surface. The profile resembles that of the Miami soil, the upper layers being similar though they are not quite so definitely developed as in the Miami soils. Milton silt loam was mapped in Wayne County. A virgin profile shows the following layers: (1) Dark-brown, friable soil, 1 or 2 inches thick, containing much humus and undecomposed organic matter; (2) light-brown or brown friable soil, from 5 to 7 inches thick, containing humus; (3) a layer, ranging in thickness from 4 to 7 inches, of light-brown, reddish, or yellowish-brown soil heavier than that above and lacking visible humus; (4) a layer, from 10 to 20 inches thick, of heavier but somewhat friable light-reddish or yellowish-brown soil, containing some iron stains; (5) yellow or mottled yellowish-gray, brown, and reddish-brown, heavy plastic soil a few inches thick, lacking signs of glacial material and evidently derived from residual formations. This rests on and between slabs of hard, fossiliferous limestone and is alkaline in reaction. The first four layers contain a small amount of glacial rock, including smooth, rounded gravel, and the reaction is slightly acid or neutral.

The Fairmount series includes very rolling, medium dark, timbered soils residual from fossiliferous limestones and limy shales and clays. If glacial drift ever covered areas of these soils it has now been entirely removed. Outcrops and slabs of hard limestone are common on the surface. Bluegrass forms a thick sod, especially where timber was thin or has been cleared off. In virgin areas the profile shows the following layers: (1) A 1-inch layer of very dark-brown soil high in humus; (2) dark-brown or brown soil from 3 to 8 inches thick, containing more or less humus; (3) a layer, ranging in thickness from 6 to 10 inches, of brown or olive-brown, plastic clay containing some hard limestone fragments; (4) alkaline yellow, greenish-yellow, or olive-brown, sticky plastic clay, extending several inches down to and into the bedrock limestone. In thin or eroded places the olive tint in the third layer comes near the surface. The first three layers are neutral in reaction but are generally free from carbonates in the finer separates.

The Fox soils occur on well-drained, light-colored, timbered, second-bottom lands having dry gravel substrata. The soil profile shows very definite layers. Virgin areas consist of the following layers: (1) A 1 or 2 inch layer of dark-brown or grayish-brown, friable soil high in humus; (2) friable, humus-bearing soil from 3 to 5 inches thick; (3) a 5 to 10 inch layer of light-brown or light reddish-brown, friable soil containing little humus; (4) a layer, ranging in thickness from 1 to 10 or more inches, of smooth, friable, light-brown or reddish-brown soil slightly heavier than that above; (5) darker reddish-brown, gritty, friable or plastic, heavier soil from 5 to 10 inches thick; (6) from one-half to 3 inches of dark-brown, plastic, neutral or alkaline soil containing much partly weathered gravel and more nitrogen and volatile matter than the two layers just above; (7) clean, dry gravel, largely dolomite. This layer is alkaline and may be slightly weathered and stained in the upper part. Plowing may mix the surface layers and produce a humus-bearing soil from 6 to 10 inches thick. The first five layers are acid or slightly acid in reaction.

The Bellefontaine soils are well-drained, light-colored soils, with more or less gravel in the substratum. These soils are distinguished from the Miami soils by slightly higher oxidation of the materials, by the more or less gravelly parent material, and by the more rolling relief. They differ from the Fox soils in that the gravel occurs in irregular, cross-bedded pockets and in that the relief is rolling, whereas in the Fox soils the gravel lies in continuous, horizontal beds, and the surface is flat. It is evident that the Bellefontaine soils can have no constant, characteristic profile. Where the materials are heavier the profile is like that of the Miami soils, with slightly more reddish shades of color, but the soil in gravelly areas has the profile of the Fox soils. The latter profile is considered more normal to the Bellefontaine soils. In some gravelly areas the profile is unlike that of the Fox soils in that there are reddish, weathered, gravelly layers below the heaviest-textured subsoil layer.

The Rodman soils are closely related to the Bellefontaine but are younger. A heavy subsoil layer is only very slightly developed, and unweathered gravel are found throughout the soil. The stoniness of the surface soil, the droughty substratum, and the rather uneven relief cause these soils to have a comparatively low agricultural value. The soils occur on kames and eskers and are light colored and timbered.

The Bethel series includes light-colored soils developed on timbered, rather flat uplands where drainage is imperfect. These soils are derived from the same kind of glacial till as the Miami soils. In virgin areas their profile shows the following layers: (1) About a 2-inch layer of dark-gray soil high in humus; (2) a 2 or 3 inch layer of gray soil, typically silt loam, containing little humus and stained faintly with brown iron stains along cleavage planes; (3) light-gray or almost white, friable, very silty soil, from 3 to 5 inches thick, showing practically no mottling or signs of humus but containing, as do the overlying layers, varying quantities of small black and brown iron concretions; (4) a 6-inch layer of mottled light-gray and yellowish-brown, heavier, more sticky soil; (5) a 6 or 8 inch layer of mottled gray, brown, and yellowish-brown, heavy, plastic, impervious clay or clay loam, containing more or less grit and weathered rock; (6) mottled brown and gray, gritty, heavy soil, which is neutral in reaction and which in places is marked by darker shades of color; (7) parent material, slightly weathered in the upper part, of mottled yellowish-brown, brown, and gray, gritty, stony, calcareous till. The first five layers are markedly acid. In Wayne County the Bethel soils were mapped only in areas which definitely had the profile described, especially a well-developed third layer. The areas are small and flat and occupy divides farthest from drainage ways.

The Crosby series includes medium light-colored soils, developed on timbered, gently undulating uplands where drainage was fair or poor. These soils are derived from limy glacial till. They vary in characteristics between the Miami and Bethel soils and there are small included areas of dark soils which tend to make the Crosby, as mapped, average darker in color than is considered typical of light land. In Wayne, as well as other eastern Indiana counties, many lands have the light-gray subsurface layer of the Bethel soils in virgin areas, but this characteristic layer is destroyed the first time they are broken, and they have been included with the Crosby soils in mapping. The typical profile of the Crosby soils in virgin areas is as follows: (1) A 1 or 2 inch layer of dark grayish-brown friable soil with a high humus content; (2) a 2 or 3 inch layer of grayish-brown or brownish-gray, friable soil containing little humus; (3) a 3 or 4 inch layer of light grayish-brown or mottled light-gray and yellow, friable soil lacking visible humus; (4) a transitional zone, several inches thick, of heavier, mottled light-gray, brown, and yellow soil; (5) a layer, from 6 to 10 inches thick, of heavy, compact, impervious mottled yellow, brown, and gray, gritty soil; (6) a thin layer of darker-brown, yellow, or gray, gritty, stony, heavy soil which is neutral in reaction; and (7) calcareous gritty, stony, heavy till, mottled yellow, brown, and gray in color. All layers above and including the fifth are acid in reaction.

Table 8 shows the results of mechanical analyses of samples of the various layers of Crosby silt loam, the characteristic soil of the Crosby series.

TABLE 8.—*Mechanical analyses of Crosby silt loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
283758	Surface soil, 0 to 3 inches	0.6	3.4	2.0	9.4	10.8	60.5	13.3
283759 283760 283761	Subsurface soil, 4 to 18 inches	1.4	3.4	1.6	7.4	9.4	61.8	15.3
283762 283763	Subsoil, 19 to 28 inches	1.4	3.1	2.7	15.2	13.0	40.2	24.7
283764	Subsoil, 29 to 60 inches	2.4	7.4	4.8	20.8	17.2	31.2	16.1

The Fincastle soils are the equivalent of the Crosby in general appearance and character but are weathered more deeply. The silty upper layers have a greater total thickness, and the calcareous till lies at a depth of about 50 inches.

The Homer soils are light-colored, timbered land occupying very slight, rather flat rises on glacial terraces where surface drainage and underdrainage are poor, owing to the imperviousness of the subsoils and the height of the water table. The profile of these soils varies between that of the Crosby and Bethel soils down to the unweathered substratum, which consists of yellow, gray, and brown alkaline water-laid, more or less stratified clays, sands, and gravel.

The second group of mineral soils in Wayne County, those marked by rather deep and dark-colored surface layers and by poor natural drainage, includes members of the Brookston, Clyde, Abington, Westland, and Millsdale series.

The Brookston series includes the soils developed in the moderately or comparatively depressed areas in the glacial till uplands. They have dark surface soils and naturally imperfect surface and underdrainage. These soils are less poorly drained and lighter in color than the Clyde soils, and brown rather than gray is the predominant soil color. In virgin areas the profile of the Brookston soils shows the following layers: (1) A 1 or 2 inch layer of very dark-brown mucky soil; (2) dark-brown soil high in humus and 4 or 5 inches thick; (3) dark-brown or brown soil from 5 to 10 inches thick; (4) mottled brown, yellowish-brown, gray, and yellow clay or clay loam apparently free from the humus coloration found above and ranging in thickness from about 10 to 30 inches; (5) mottled yellow, gray, brown, and yellowish-brown, gritty calcareous till, which lies at a depth ranging from 40 to 60 inches below the surface. The Brookston soils are commonly associated with the Miami or Crosby soils. Areas associated with the Russell soils are a little paler in color than typical and on the average are free from carbonates to a greater depth.

The Clyde series includes the darkest-colored soils in the lowest parts of depressions in the glacial-till uplands. The areas were naturally timbered swamps in which surface and underdrainage were poor. It was found very difficult to consistently distinguish the Clyde from the Brookston soils on the basis of color of the surface soils, degree of depression, or drainage conditions. The most definite difference between soils of the two series is in the lower part of the profile. In virgin areas the profile of the Clyde soils shows the following layers: (1) A 2-inch layer of very dark grayish-brown mucky soil; (2) a layer, from 4 to 8 inches thick, of dark grayish-brown humous soil, slightly tinged with rust brown; (3) from 5 to 10 inches of dark-gray, bluish-gray, or gray material containing a little humus and showing brown or rust-brown stains or mottles; (4) lighter-gray or bluish-gray clay or silty clay slightly stained with iron and containing no visible humus; (5) mottled yellow, gray, bluish-gray, yellowish-brown, and rust-brown clay containing more or less gritty material; (6) mottled yellow, gray, and brown calcareous till which is probably true parent material of the overlying layer and to a less extent of the upper layers, which have received more or less overwash of fine earth and an accumulation of organic matter.

The Abington series includes the darkest soils in the lowest parts of depressions in glacial terraces, where originally there were poorly drained swamps or marshes. These soils are the terrace or lake equivalents of the Clyde soils and differ from the Clyde chiefly in that the underlying material is assorted rather than unassorted. The Abington soils also tend to be a little more poorly drained and marshy than the Clyde and a little more mucky in the surface layers. In virgin areas the profile shows the following layers: (1) A 1 or 2 inch layer of very dark-gray, brown, or black mucky soil; (2) a layer, from 6 to 10 inches thick, of dark-gray, brownish-gray, or grayish-brown soil containing much humus and some gravel; (3) gray, bluish-gray, or dark grayish-brown material, with brown iron stains and containing some visible humus; (4) bluish-gray, gray, or light-gray heavy material, in places stained with iron and containing visible humus; (5) mottled or variegated light-gray, gray, bluish-gray, or grayish-brown partly weathered materials; (6) calcareous, sticky, sandy, gravelly, more or less assorted, water-laid and waterworn light-gray, gray, and rust-brown materials. This layer distinguishes the Abington from the Clyde soils, in which the corresponding layer is heavy yellow, gray, and brown till. As a rule the four upper layers are slightly acid or neutral, but the fifth layer is neutral or alkaline near limy gravel.

The Westland soils are terrace equivalents of the Brookston soils in many respects. They are moderately dark, depressed, poorly drained lands occurring on the glacial terraces and lake plains. A virgin profile shows the following layers: (1) A 1 or 2 inch layer of very dark grayish-brown soil high in humus; (2) several inches of dark brownish-gray soil containing humus; (3) more or less mottled grayish-brown and yellowish-brown material tinged with darker-brown humus, especially along cleavage planes; (4) mottled light yellowish-brown, brown, and gray heavy soil; (5) stratified layers of assorted materials varying from very heavy lacustrine clays to clayey, waterworn gravel mottled light gray, yellowish brown, brown, and bluish gray in color and alkaline in reaction. This layer shows the most definite differences from the Brookston profile and presents many variations. The material in the first four layers is slightly acid or neutral.

The Millsdale series includes the darker-colored soils developed on terracelike, rock-bottomed benches with some admixture of glacial materials with the residual material below. These soils are associated with the Milton soils, which cover the lighter-colored parts of the same benches. Because of their small total extent, these soils are made to cover a rather wide range of conditions comparable to those covered by both the Clyde and Brookston series. However, most of this land is of the shallower, browner phase comparable to the Brookston soils. A virgin profile shows the following layers: (1) A 1 or 2 inch layer of very dark-brown mucky soil; (2) dark-brown soil containing much humus and some glacial grit; (3) dark grayish-brown material from 8 to 12 inches thick; (4) a 4 or 6 inch layer of mottled brown, yellowish-brown, and gray soil; (5) mottled yellow, gray, and grayish-yellow, heavy, plastic clay, several inches thick, which is more or less modified residual material resting on and bedded between limestone slabs and bedrock. This layer is alkaline in reaction.

Soils derived from or consisting of recently deposited alluvium are included in the Genesee and Eel series. The Genesee soils are brown, well-drained alluvial soils derived from more or less calcareous glacial-till uplands. Their layers are very variable in texture, due to deposition by flood waters of modern streams. The sediments are neutral or alkaline in reaction, and the soils are fertile. The land is subject to overflow. The Eel series includes grayish-brown alluvial soils with mottled light-gray, yellow, and brown subsoils. The layers are due to deposition by flood waters of modern streams and are modified by poor drainage condition in the stream bottoms in which these soils occur. The soils are subject to overflow. The land was naturally timbered. The materials are neutral in reaction, and the land is fertile where well drained.

SUMMARY

Wayne County is in the east-central part of Indiana. The county is approximately square and includes an area of 405 square miles. Physiographically this region is part of the till plains section of the East Central States. The main local features are glacial uplands, extensive glacial river terraces or outwash plains, and recent-alluvial bottoms. The terraces and bottoms are narrow in the northern part of the county and widen as they converge in the southern part. The average elevation of the county is estimated at 1,035 feet. Wayne County lies wholly within and includes most of the headwater part of the Whitewater River drainage basin, and the county as a whole is well drained either naturally or by dredged outlets, open ditches, and tile drains.

The most important city and local market of the county is Richmond, which lies 60 miles east of Indianapolis and is the county seat.

The large surplus of farm crops and livestock is shipped from here and the smaller towns in the county. The county has excellent railroad facilities, and the county roads are almost without exception very good.

The agriculture consists of general farming, about three-fourths of the county being under clean cultivation. About one-tenth of the county is woodland. The timber growth consists of oaks, hard maple, hickory, and walnut on the better-drained lands; beech on the wet flats; and white elm, white ash, red oak, hickory, and other hardwoods on the low black land. Pin oak, sycamore, and willow also occur in lowlands and bottoms.

The climate of Wayne County is humid and temperate, with well-distributed rainfall.

Twenty-three soil types and three phases of types, two organic soils, and one miscellaneous class of material are mapped. The most important of these, Miami silt loam, occupies about one-third of the area of the county. It is a well-drained light-colored soil and occurs on the undulating or rolling uplands. It is good agricultural land.

Russell silt loam and Bellefontaine silt loam are light-colored, well-drained soils similar to Miami silt loam but of comparatively small total area.

Crosby silt loam is the second most important soil in the county. It is a light-colored soil of the uplands. It is largely utilized for cultivated crops but is not regarded as quite so good a soil as Miami silt loam. Similar soils are Bethel silt loam, Fincastle silt loam, and Homer silt loam.

Brookston silty clay loam is a dark-colored soil occurring in the poorly drained depressions of the uplands. Other dark-colored, poorly drained but fertile soils of small total area are Clyde silty clay loam, Millsdale silt loam, Abington silt loam, Abington silty clay loam, and Westland silty clay loam.

Fox silt loam is a light-colored, well-drained soil occupying the river terraces and outwash plains of the county. It is one of the most highly valued soils in Wayne County. Other members of the Fox series mapped are Fox loam and Fox fine sandy loam.

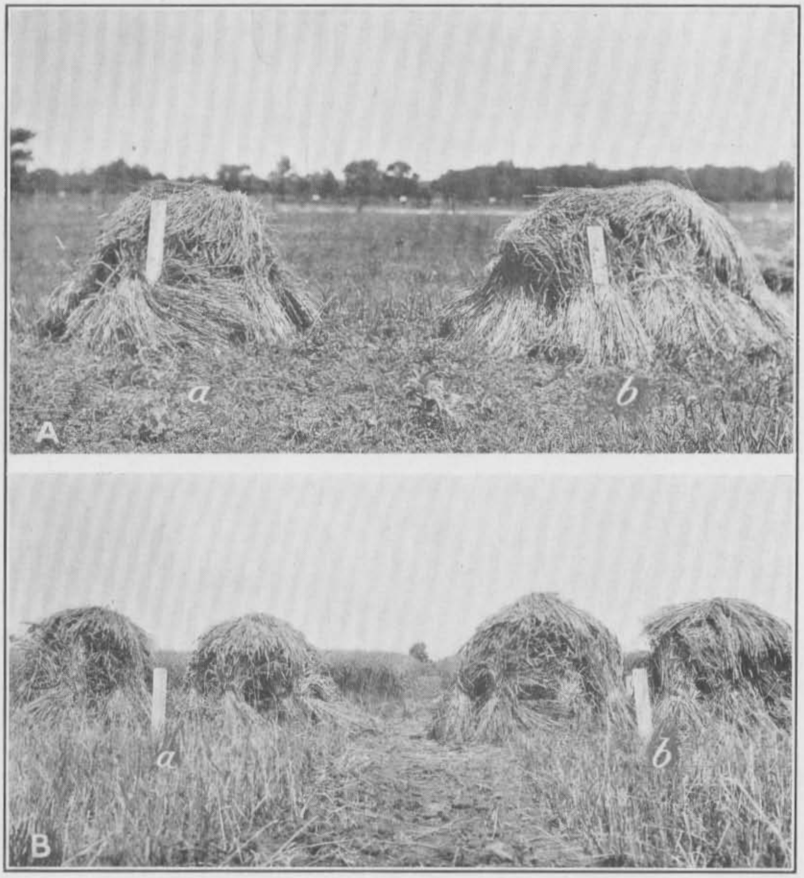
Genesee silt loam, Genesee loam, and Genesee fine sandy loam are well-drained, light-colored, fertile soils of the stream bottoms. Eel silt loam, associated with the Genesee soils in the stream bottoms, is poorly drained.

Fairmount silty clay loam and Milton silt loam are minor soils underlain at a slight depth by bedrock.

Muck and peat are organic soils with a very small total area. River wash is nonarable alluvial material.

Agriculture in Wayne County has been marked by a pioneer period of self-sufficient farms, with settlement on the better-drained lands, a period of expansion when markets were provided by growth of urban population and the development of transportation, and a recent period during which there has been no advance but rather a decline in rural population, in farm land values, and in total production of some farm crops. Corn has been for many years and is at present the leading farm crop. Other important crops are wheat and timothy and red clover hay. Alfalfa, soybeans, and sweetclover are less important.

The relative proportion of the different soils on the farms governs agriculture to a considerable extent. Fox silt loam, Genesee silt loam, and Brookston silty clay loam are recognized as excellent corn soils. The Fox, Bellefontaine, and Miami soils are generally preferred for alfalfa. Wheat is generally more successful on the well-drained, lighter-colored upland soils, such as members of the Miami and Russell series, than on the dark-colored soils, such as Brookston silty clay loam.



A.—Comparative yields of wheat on Crosby silt loam on an experiment field in Randolph County. *a*, Untreated; *b*, 300 pounds 2-12-6 fertilizer to the acre

B.—Comparative yields of wheat following manured corn on a good field of Crosby silt loam. *a*, No commercial fertilizer; *b*, 300 pounds 2-12-8 fertilizer

PART 2. THE MANAGEMENT OF WAYNE COUNTY SOILS

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INTRODUCTION

The farmer should know his soil and have a sound basis for every step in its treatment. Building up the productivity of a soil to a high level, in a profitable way, and then keeping it up is an achievement for which every farmer should strive. The business of farming should be conducted as intelligently and as carefully as a manufacturing business, in which every process must be understood and regulated, from the raw material to the finished product, in order to be uniformly successful. The farmer's factory is his farm and a knowledge of the soil is highly important. Different soils present different problems of treatment, which must be studied and understood in order that crops may be produced in the most satisfactory and profitable way.

It is the purpose of the following discussion to call attention to the deficiencies of the several soils of the county and to outline in a general way the treatments most needed and most likely to yield satisfactory results. No system of soil management can be satisfactory that does not in the long run produce profitable returns. Some soil treatments and methods of management may be profitable for a time but ruinous in the end. One-sided or unbalanced soil treatments have been altogether too common in the history of farming in this country. A properly balanced system of treatment will make almost any soil profitably productive.

CHEMICAL COMPOSITION OF WAYNE COUNTY SOILS

Table 9 gives the results of chemical analyses of the different types of soil in Wayne County expressed in pounds of elements in 2,000,000 pounds of plowed surface soil of an acre.

TABLE 9.—*Chemical composition of Wayne County soils*

[Elements, in 2,000,000 pounds of surface soil to the acre]

Element	No. 2, Miami silt loam	No. 22, Russell silt loam	No. 35, Milton silt loam	No. 15, Crosby silt loam	No. 57, Bethel silt loam	No. 54, Homer silt loam	No. 30, Bellefontaine silt loam	No. 17, Fox silt loam, deep phase
Phosphorus [1]	873	1,222	1,222	873	1,311	786	873	1,483
Potassium [1]	4,540	4,204	2,690	3,027	3,531	2,354	4,204	4,372
Calcium [1]	3,143	4,429	5,000	6,000	3,857	8,143	4,572	6,143
Magnesium [1]	4,220	3,500	9,400	4,580	2,650	5,070	4,340	4,460
Manganese [1]	500	1,150	1,150	580	720	290	580	720
Aluminum [1]	30,300	32,800	37,100	18,700	40,600	41,000	27,200	27,600
Iron [1]	33,500	42,500	42,500	64,000	25,500	32,000	53,000	49,000
Sulphur [1]	400	560	560	240	480	480	160	240
Phosphorus [2]	36	30	44	44	44	35	52	32
Potassium [2]	50	151	59	180	67	76	50	219
Nitrogen [3]	2,200	3,300	2,600	2,400	3,400	2,800	2,600	2,800
Potassium [3]	28,100	31,100	28,200	27,400	33,800	28,200	29,300	27,700

[1] Soluble in strong hydrochloric acid (specific gravity, 1.115).
[2] Soluble in weak nitric acid (fifth-normal).
[3] Total.

TABLE 9.—*Chemical composition of Wayne County soils*—Continued

Element	No. 8, Fox silt loam	No. 51, Fox loam	No. 37, Fox fine sandy loam	No. 21, Brookston silty clay loam	No. 42, Westland silty clay loam	No. 10, Millsdale silt loam	No. 56, Clyde silty clay loam	No. 29, Abington silt loam
Phosphorus [1]	961	2, 185	1, 222	2, 534	1, 573	2, 796	2, 097	1, 835
Potassium [1]	3, 531	3, 195	2, 522	6, 222	5, 045	7, 399	4, 540	5, 045
Calcium [1]	4, 286	15, 714	3, 857	9, 572	12, 429	20, 000	13, 286	12, 143
Magnesium [1]	3, 130	7, 960	2, 530	6, 030	5, 790	7, 360	7, 360	5, 790
Manganese [1]	1, 440	570	1, 300	1, 300	860	430	860	720
Aluminum [1]	34, 600	45, 100	28, 100	59, 800	35, 000	87, 700	58, 000	48, 500
Iron [1]	45, 500	45, 500	35, 400	42, 500	64, 000	64, 000	39, 800	32, 000
Sulphur [1]	400	480	320	320	560	560	1, 040	240
Phosphorus [2]	105	460	122	87	105	262	367	192
Potassium [2]	219	219	151	112	168	286	134	168
Nitrogen [3]	2, 800	3, 600	2, 400	5, 800	5, 500	5, 000	5, 600	4, 600
Potassium [3]	30, 400	25, 900	27, 400	29, 900	37, 000	35, 800	31, 300	34, 000

Element	No. 20, Abington silty clay loam	No. 43, Fairmount silty clay loam	No. 11, Eel silt loam	No. 14, Genesee silt loam	No. 47, Genesee loam	No. 39, Genesee fine sandy loam	No. 31, Muck	No. 32, Peat
Phosphorus [1]	2, 185	5, 592	1, 398	2, 010	1, 222	1, 222	3, 233	2, 971
Potassium [1]	6, 053	11, 434	4, 540	2, 690	3, 195	2, 522	1, 682	2, 522
Calcium [1]	17, 800	19, 200	12, 860	46, 000	72, 860	78, 700	90, 000	45, 720
Magnesium [1]	10, 130	9, 410	5, 790	8, 560	11, 220	12, 670	7, 840	6, 150
Manganese [1]	720	860	430	1, 150	580	430	430	860
Aluminum [1]	41, 900	59, 500	40, 000	39, 400	14, 800	27, 000	29, 100	44, 500
Iron [1]	64, 000	91, 000	45, 500	64, 000	79, 700	39, 800	42, 500	25, 500
Sulphur [1]	320	880	240	480	1, 120	1, 120	2, 000	2, 160
Phosphorus [2]	280	1, 573	201	315	140	114	175	280
Potassium [2]	118	250	134	303	268	340	170	42
Nitrogen [3]	5, 800	7, 300	2, 800	4, 000	3, 000	1, 000	57, 600	38, 200
Potassium [3]	26, 100	45, 700	28, 800	25, 900	31, 700	24, 000	6, 600	15, 000

[1] Soluble in strong hydrochloric acid (specific gravity, 1.115).
[2] Soluble in weak nitric acid (fifth-normal).
[3] Total.

Three groups of analyses are given: (1) Total plant-food elements, (2) elements soluble in strong (specific gravity 1.115) hydrochloric acid, and (3) elements soluble in weak (fifth-normal) nitric acid.

The total plant-food content is more valuable in indicating the origin of a soil than its fertility. This is particularly true of potassium. The amount of total potassium in a soil is seldom an indication of its need of potash. Some Indiana soils which have more than 30,000 pounds of total potassium to the acre in the 6-inch surface layer fail to grow corn without potash fertilization, because so little of the potassium contained is available.

The total content of nitrogen is generally indicative of the need for nitrogen, although some soils with a low total may have a supply of available nitrogen sufficient to grow a few large crops without the addition of nitrogen. Soils having a low total nitrogen content soon wear out, so far as that element is concerned, unless the supply is replenished by the growing and returning of legumes or by the use of nitrogenous fertilizer.

The amount of total phosphorus in ordinary soils is usually about the same as that shown by a determination with strong acid. For this reason a separate determination of total phosphorus has been omitted. The supply of total phosphorus usually indicates the general need of a soil for phosphate fertilizers.

The amount of phosphorus soluble in weak acid is considered by many authorities as a still better indication of the phosphorus needs of a soil. The depth of a soil may modify its need for phosphates. Everything else being equal, the more soluble phosphorus a soil contains, the less it is apt to need phosphate fertilizers. Whenever the soluble phosphorus runs less than 100 pounds to the acre, phosphates are usually needed.

The quantity of potassium soluble in strong or weak acid is to some extent significant. This determination, however, is not so reliable an indicator as is the determination of phosphorus, particularly with soils of high lime content. Sandy soils and muck soils are more often in need of potash than clay and loam soils.

The use of strong or weak acid in the analysis of a soil has sometimes been criticized as having little or no value, yet such analyses can more often be correlated with crop production than can analyses of the total elements of the soil. For this reason acid solutions have been employed in these analyses.

It must be admitted, however, that no one method of soil analysis will definitely indicate the deficiencies of a soil. For this reason these chemical data are not intended to be the sole guide in determining the soil needs. The depth of the soil, the physical character of the subsoil and the surface soil, and the previous treatment and management of the soil are all factors of the greatest importance and should be taken into consideration. The better types of soils and those containing large amounts of plant-food elements will endure exhaustive cropping much longer than the less fertile soils.

The nitrogen, phosphorus, and potassium contents of a soil are by no means the only chemical indication of high or low fertility. One of the most important factors in soil fertility is the degree of acidity. Soils which are very acid will not produce well even though there be no lack of plant-food elements. Although nitrogen, phosphorus, and potassium are of some value on acid soils, they will not produce their full effect where lime is deficient. Table 10 shows the percentages of volatile matter and nitrogen, and the acidity of the various soils in the county. The acidity is expressed in terms of pounds of pulverized limestone needed to the acre. The determinations represent the surface soil (0 to 6 inches), the subsurface soil (approximately 6 to 18 inches), and the subsoil (approximately 18 to 36 inches).

TABLE 10.—*Nitrogen and acidity of Wayne County soils*

No.	Soil type	Depth	Nitrogen	Acidity [1]
		Inches	*Per cent*	*Pounds per acre*
2	Miami silt loam	0 to 6	0.11	60
		6 to 18	.07	80
		18 to 28	.05	20
22	Russell silt loam	0 to 6	.165	80
		6 to 12	.12	120
		12 to 24	.05	1,440
35	Milton silt loam	0 to 8	.13	60
		8 to 14	.10	780
		14 to 28	.06	260
15	Crosby silt loam	0 to 6	.12	20
		6 to 13	.07	30
		13 to 24	.05	20
57	Bethel silt loam	0 to 6	.17	80
		6 to 15	.07	280
		15 to 36	.05	None.
54	Homer silt loam	0 to 6	.14	20
		6 to 18	.08	100
		18 to 32	.04	None.
30	Bellefontaine silt loam	0 to 6	.13	40
		6 to 9	.05	360
		9 to 24	.04	4,180
17	Fox silt loam, deep phase	0 to 7	.14	40
		7 to 15	.09	20
		15 to 36	.05	80
8	Fox silt loam	0 to 8	.14	40
		8 to 20	.08	60
		20 to 32	.05	400
51	Fox loam	0 to 8	.18	None.
		8 to 16	.09	20
		16 to 23	.09	20
37	Fox fine sandy loam	0 to 6	.12	40
		6 to 12	.09	40
		12 to 30	.07	400
21	Brookston silty clay loam	0 to 8	.29	60
		8 to 16	.15	40
		16 to 24	.07	40
42	Westland silty clay loam	0 to 6	.275	60
		6 to 20	.18	40
		20 to 36	.07	40
10	Millsdale silt loam	0 to 6	.25	None.
		6 to 15	.17	60
		15 to 30	.10	60
56	Clyde silty clay loam	0 to 8	.28	20
		8 to 18	.15	20
		18 to 34	.05	20
29	Abington silt loam	0 to 7	.23	40
		7 to 15	.15	40
		15 to 30	.09	40
20	Abington silty clay loam	0 to 10	.29	40
		10 to 18	.13	40
		18 to 32	.06	20
43	Fairmount silty clay loam	0 to 6	.365	20
		6 to 15	.26	20
		15 to 24	.06	(2)
11	Eel silt loam	0 to 6	.14	60
		6 to 20	.10	40
		20 to 30	.06	20
14	Genesee silt loam	0 to 6	.20	None.
		6 to 18	.17	40
		18 to 36	.14	(2)
47	Genesee loam	0 to 6	.15	None.
		6 to 18	.15	None.
		18 to 36	.11	None.
39	Genesee fine sandy loam	0 to 6	.05	None.
		6 to 18	.04	None.
		18 to 36	.04	None.
31	Muck	0 to 9	2.88	None.
		9 to 15	1.90	None.
		15 to 34	1.09	(2)
32	Peat	0 to 8	1.91	140
		8 to 34	1.90	160
		34 to 43	1.80	200

[1] Hopkins method, pounds $CaCO_3$ required in 2,000,000 pounds of surface soil to the acre.
[2] Calcareous.

It is important to know the reaction not only of the surface soil but of the lower layers of the soil as well. Given two soils of the same acidity, the one with the greater acidity in the subsurface layer is in greater need of lime than the other. Furthermore, the more organic or volatile matter and nitrogen a soil contains and the greater the depth to which they extend, the less will be its need for lime.

In interpreting the soil survey map and analyses, it should be borne in mind that a well-farmed, well-fertilized or manured soil, which is naturally low in fertility, will produce larger crops than a poorly farmed soil that is naturally high in fertility.

SOIL MANAGEMENT

For convenience in discussing the management of the several soils of the county, they have been arranged in groups according to certain important characteristics which indicate that in many respects similar treatment is required. For example, several of the upland silt loams, which have practically the same requirements for their improvement, may be conveniently discussed as a group. Thus the repetition that would be necessary if each were discussed separately is avoided. Where different treatments are required they are specifically pointed out. The reader should study the group including the soils in which he is particularly interested.

LIGHT-COLORED SILT LOAM UPLAND SOILS

This group includes the silt loam soils of the Miami, Milton, Russell, Crosby, Bethel, Fincastle, and Bellefontaine series. The practical problems in the management of these soils are more or less similar. Important differences in natural productivity do exist and are fully recognized, but they are differences in degree and do not require separate groupings for the purpose of this discussion. In the discussion which follows these differences will be indicated.

As a general proposition, all these soils are naturally deficient in phosphorus. There is also a more or less pronounced deficiency in nitrogen and organic matter. In most cases there is also need for more available potassium.

Drainage.—The Bellefontaine and most of the Miami, Milton, and Russell soils have fair or good natural drainage. Some areas of the Miami, Russell, and the deeper Milton soils, especially the more level areas, would be benefited by tile drainage. Wherever there is a tight subsoil the land should be tiled, as without underdrainage surface erosion is more apt to occur. Surface run-off should be prevented as far as possible, because it carries away large quantities of available plant food which should go into the production of crops. Rain water should be absorbed by the soil, and the surplus should pass away through underdrains. Underdrainage increases the capacity of the soil to absorb water, lessens surface erosion, and also facilitates soil aeration, which helps to make the plant food in the soil available.

The Bethel, Crosby, and Fincastle soils are naturally poorly drained and are more or less urgently in need of artificial underdrainage by means of tile. Their generally flat surfaces and tight subsoils make natural drainage very slow and difficult. A mottled subsoil is a further indication of insufficient natural drainage. Without tile drainage these soils can not be satisfactorily managed, and no other beneficial soil treatment can produce its full effect. Results on experiment fields on other soils of similar texture and topography indicate that tile lines laid 30 inches deep and not more than 3 rods apart will give profitable results. Where the land is very flat, great care must be exercised in tiling in order to obtain an even grade and uniform fall. Grade lines should never be established by guess or any rule-of-thumb method. Nothing less accurate than a surveyor's instrument should be used, and the lines should be accurately staked and graded before the ditches are dug, to make sure that all the water will flow to the outlet with no interruption or slackening of the current. The rate of fall may be increased toward the outlet, but it should never be lessened. Checking the current may cause the tile to become choked with silt. It is an excellent plan, before filling the ditches, to cover the tile to a depth of a few inches with straw, weeds, or grass cut from the fields. This prevents silt from washing into the tile at the joints while the ground is settling, thus insuring perfect operation of the drains from the beginning.

Liming.—The need of lime should be determined by soil-acidity tests. If the farmer himself can not make the test, he can have it made by the county agricultural agent or by the agricultural experiment station at Lafayette. A very acid soil will not respond properly to other needed treatments until it has been limed.

Tests of samples of the soils in this group, taken when the county was mapped, do not show any very general need of lime. The Bethel, Crosby, Fincastle, and Russell soils are most likely to need liming. Failure of clover to develop satisfactorily indicates a need of lime, although lack of thriftiness in clover may also be due to lack of available phosphorus. Ground limestone will be the most economical form of lime to use in most places. The first application should usually be 2 tons to the acre. After that a ton to the acre every second round of the crop rotation will keep the soil reasonably sweet. Where alfalfa or sweetclover is to be grown on an acid soil, heavier applications of lime may be needed.

Organic matter and nitrogen.—All the soils of this group are naturally low in organic matter and nitrogen. Constant cropping without adequate returns has made matters worse, so that in many places the original supplies of organic matter have become so reduced that the soil has lost much of its natural mellowness and easily becomes puddled and baked. This condition, in a large measure, accounts for the more frequent clover failures and the greater difficulty in securing proper tilth where the land has been cropped for a long time without adequate returns.

Wherever these evidences of lack of organic matter and nitrogen are found, the only practical remedy is to plow under more organic matter than is used in the process of cropping. Decomposition is constantly going on and is necessary to maintain the productivity of the soil. Decomposing organic matter must also supply the bulk of the nitrogen required by crops. For this reason legumes should be planted in order to provide large quantities of organic matter to be plowed under. To do this satisfactorily, the land must first be put in condition to grow clover and other legumes. This means liming wherever the soil is acid, and also applying soluble phosphates, because all acid soils are deficient in available phosphorus. After liming, at least 200 or 300 pounds of superphosphate should be applied to the acre. Wet lands must also be tile drained. Clover or other legumes should appear in the rotation every two or three years; as much manure as possible should be made from the produce that can be utilized by livestock; and all produce not fed to livestock, such as cornstalks, straw, and cover crops, should be plowed under directly. It must be remembered that legumes are the only crops that can add appreciable quantities of nitrogen to the soil, and then only in proportion to the amount of top growth that is plowed under, either directly or in the form of manure. Whenever cloverseed crops are harvested, the haulm should be returned to the land and plowed under. Cover crops should be grown wherever possible to supply additional organic material for plowing under. Planting soybeans or cowpeas between the corn rows at the time of the last cultivation and seeding rye as a cover crop early in the fall on cornland that is to be plowed the following spring are good practices for increasing both nitrogen and organic matter. It is important to have some kind of a growing crop on these soils over winter to take up the soluble nitrogen, which would otherwise be lost through leaching. Without living crop roots to take up the nitrates from the soil water, large losses will occur between crop seasons through drainage. In this latitude the ground is not frozen much of the time during the winter, so that frequent heavy rains cause much leaching, especially of nitrates. The winter rains also cause much soil erosion on slopes and hillsides where the ground is not well covered with vegetation. Both of these losses may be considerably lessened by a good cover of winter rye on all lands that would otherwise be bare over winter.

Crop rotation.—With proper fertilization, and liming and tile drainage where needed, these soils will satisfactorily produce all the ordinary crops adapted to the locality. On account of the prevailing shortage of organic matter and nitrogen, every system of cropping should include clover or some other legume to be returned to the land in one form or another. Corn, wheat, and clover constitute the best short rotation for general use on these soils, especially when the corn can be cut off and the ground disked and properly prepared for the wheat. In this position in the rotation, wheat needs a high-analysis complete fertilizer and the quantity applied should be sufficient to help the clover also. Corn, soybeans, wheat, and clover is an excellent 4-year rotation for these soils. The two legumes in this rotation will build up the nitrogen supply. The soybean straw should be spread on the wheat in the winter. This will not only help the wheat and lessen winter injury but it will help to insure a stand of clover. Oats are not adapted to the climatic conditions and, as a rule, are not a profitable crop. The soybean is not only worth more as a crop but it also adds some nitrogen to the soil and improves it for the crop, generally wheat, that follows. If more corn is wanted, the 5-year rotation of corn, corn, soybeans, wheat, and clover may be used satisfactorily where the second corn crop can be given a good dressing of manure. A cover crop of rye, for plowing under the following spring, should be seeded in September on all the cornland. Timothy is not a good crop for these soils. Alfalfa and sweetclover may be grown on the better-drained and more friable soils, if they are properly inoculated and sufficiently limed to neutralize harmful acidity. Special literature on the soil and on the cultural requirements of these crops can be obtained from the Purdue University Agricultural Experiment Station.

Fertilization.—All the soils of this group are naturally low in phosphorus, and the available supplies of this element are so extremely low that the phosphorus required by crops should be wholly supplied in applications of manure and commercial fertilizer. The nitrogen supplies in these light-colored soils are also too low for the production of satisfactory crops of corn, wheat, and other nonleguminous crops, and provisions for adding nitrogen should be an important part of the soil-improvement program. The total quantities of potassium in these soils are large but the available supplies are low, and in most cases the addition of some potash fertilizer would be profitable, especially where little manure is applied.

The problem of supplying nitrogen has been discussed in connection with provisions for supplying organic matter. Legumes and manure are the logical and only really practical means of supplying the bulk of the nitrogen needed by crops and should be largely relied on for this purpose. A livestock system of farming, with plenty of legumes in the crop rotation is, therefore, best for these soils. However, it will pay, in most cases, to have some nitrogen in the fertilizer for wheat, regardless of its place in the rotation. Even though wheat follows soybeans or other legumes, it should receive some fertilizer nitrogen at seeding time to properly start the crop, because the nitrogen in the residues of any immediately preceding legume does not become available quickly enough to be of much help to the wheat in the fall. The leguminous residue must first decay, and that does not take place to any considerable extent until the following spring.

On the experiment field on the Herbert Davis forestry farm, located on Crosby silt loam in Randolph County and belonging to Purdue University, highly profitable returns have been obtained wherever available phosphate has been applied. During the five years since this experiment was begun, applications of 100 pounds to the acre of 16 per cent superphosphate in the row for corn and 225 pounds for wheat in a corn, wheat, and clover rotation, have produced crop increases averaging 7.4 bushels of corn, 7.7 bushels of wheat, and 466 pounds of hay to the acre, worth $17.43 an acre for each rotation, at a cost of $3.60 for the phosphate. On land receiving 6 tons of manure to the acre, 225 pounds of superphosphate applied on wheat only has increased the crop yields over manure alone by 1.8 bushels of corn, 8.3 bushels of wheat, and 64 pounds of hay. These experiments demonstrate the importance of using liberal applications of phosphate on this kind of soil both with and without manure. Applications of 300 pounds to the acre of a 2–12–6 fertilizer on wheat (pl. 1, A) and 100 pounds in the row for corn has produced $19.21 worth of crop increases to the acre for each rotation at a cost of $7.04 for the fertilizer.

Phosphorus is the mineral plant-food element in which all these soils are most deficient. The only practical way to increase the supply is through the application of purchased phosphatic fertilizers. It will pay well to supply the entire phosphorus needs of crops in this way. In rotations of ordinary crops, producing reasonable yields, it may be counted that 20 pounds of available phosphoric acid to the acre is required each year. It will pay well to apply larger quantities at first so as to create a little reserve. Enough for the entire rotation may be applied at one time, or the application may be divided according to convenience. Where manure is applied, it may be counted that each ton supplies 5 pounds of phosphoric acid, so that a correspondingly smaller quantity will be required in commercial fertilizer.

The quantity of potash that should be supplied as fertilizer depends on the general condition of the soil and the quantity of manure used. In building up a run-down soil, some fertilizer potash should be used at least until such time as considerable quantities of manure can be applied or until the general condition of the soil has materially improved. The flat areas of the gray soils are likely to be most in need of applications of potash. There is plenty of potassium in these soils for all time if it could only be made available at a faster rate. As a rule it becomes available too slowly. Its availability may be increased by good farm practices, including proper tillage, tile drainage, the growing of deep-rooted legumes, and the plowing under of liberal quantities of organic matter. The better these practices are carried out and the greater the quantity of manure applied, the less potash fertilizer will have to be purchased.

In the fertilization of these soils, the manure should usually be plowed under for corn but a part, about 2 tons to the acre, may be applied profitably on wheat as a top-dressing during the winter. This practice not only helps the wheat crop and lessens winter injury, but also helps to insure a stand of clover or other crop seeded in the wheat. As a rule, the manured corn should also receive some available phosphate. Without manure, corn should be given from 200 to 300 pounds to the acre of a good phosphate and potash mixture applied before planting and, on poor soils without a preceding legume, perhaps also a little complete fertilizer in the row. Wheat should be given from 200 to 300 pounds to the acre of a high-analysis complete fertilizer, at least as high as 2–12–6. (Pl. 1, B.) On poor soils or where the wheat is backward in the spring, a top-dressing of a good carrier of nitrogen should be applied in April when the wheat is 3 or 4 inches high. Where corn and wheat are included in the rotation and these are properly fertilized, little fertilizer will be required on other crops.

LIGHT-COLORED TERRACE SOILS

In this group are included Fox silt loam, Fox loam, Fox fine sandy loam, Homer silt loam, and Rodman gravelly loam. Fox silt loam is the only one of these soils that is of much importance in Wayne County. The others are of small extent and comparatively unimportant.

Drainage.—Most of these soils are well or excessively drained and, with the exception of Homer silt loam and the deep phase of Fox silt loam, are more or less inclined to be droughty. Only the small areas of Homer silt loam would be benefited by tile drainage.

Liming.—For the most part, these soils are not in need of liming. Some of the deeper Fox silt loam and Homer silt loam may need some lime for alfalfa or sweetclover.

Organic matter and nitrogen.—What has been said under this head regarding the light-colored upland soils applies equally to these terrace soils. The lighter-colored, the more sandy, and the shallower areas are especially in need of more organic matter to improve their water-holding capacity and make them less droughty. Legumes, cover crops, and other special green-manure crops, as well as manure, should be used as much as possible for plowing under.

Crop rotation.—For the most part, these soils are adapted to the same crops as the upland soils, although corn often does not do so well on account of summer droughts. The small grains will usually escape serious injury from this source. Soybeans, because of their ability to resist drought, are especially well suited to these soils, but as a rule grass does not do well. Deep-rooted legumes, such as red clover, alfalfa, and sweetclover, will thrive on these soils if supplied with sufficient quantities of available phosphate and potash. These crops should be grown more extensively.

Fertilization.—The light-colored terrace soils should be fertilized in about the same way as the light-colored upland soils. Nitrogen should be supplied largely through legumes and manure. Considerable quantities of available phosphate should be supplied for all crops and when manure is scarce some potash fertilizer will be necessary. Wheat should always receive a good complete fertilizer. For alfalfa, a half-and-half phosphate-potash mixture will give good results.

DARK-COLORED UPLAND AND TERRACE SOILS

This group includes the Abington, Brookston, Clyde, Fairmount, and Westland silty clay loams, and the Abington and Millsdale silt loams. The practical problems in the management of these soils are more or less similar. A common natural defect, except in Fairmount silty clay loam, is their poor drainage. They are all well supplied with nitrogen. The Brookston soil is somewhat low in available phosphorus, whereas the Fairmount is exceptionally high in both total and available supplies of this element. The Brookston soil seems rather low and the Westland soil exceptionally low in available potassium.

Drainage.—All these soils are more or less in need of artificial drainage. Their dark color indicates a swampy origin where natural drainage was poor. To a large extent, artificial drainage has been provided for these soils and surplus water is fairly well taken care of. In many cases, however, there would be a good response to more tiling. Where this is needed, the same procedure should be followed as that suggested for the light-colored silt loam upland soils.

Liming.—Acidity tests of these dark-colored soils do not show any need of lime.

Organic matter and nitrogen.—For the most part, these soils are naturally well enough supplied with organic matter and nitrogen to meet the needs of most crops, and with reasonable care in their management, no special provisions for supplying these constituents will be necessary for a long time. Such crops as wheat, however, should generally receive some readily available nitrogen in the fertilizer.

Crop rotation.—These dark-colored soils are among the best in the county and will produce all the ordinary crops adapted to the region. They are especially well suited to corn, and this should generally be the major crop. Among the rotations that may be satisfactorily employed are: Corn, wheat, and clover; corn, corn, wheat, and clover; corn, soybeans, wheat, and clover; corn, corn, soybeans, wheat, and clover. Where timothy is wanted, this may be seeded with the wheat and the rotation lengthened one year. Where sufficient drainage has been provided these soils are also suited to alfalfa and sweetclover. Whenever clover fails, soybeans make a satisfactory substitute crop for legume hay. Sudan grass may also be used as a substitute hay crop.

Fertilization.—These soils are naturally fairly well supplied with nitrogen and, with a legume included in the crop rotation, the fertilizer need not contain nitrogen except for wheat. As a rule, wheat should receive a good complete fertilizer, such as a 2–12–6, to start it off properly in the fall. Corn should generally receive some available phosphate in addition to manure. However, on farms having both light and dark colored soils, the manure should generally be applied to the light-colored soils which are more in need of the organic matter and nitrogen of the manure. Without manure, it will generally pay to use a phosphate and potash mixture for corn on these dark-colored soils, especially the Westland and Brookston soils, which seem to be lowest in available supplies of these important constituents.

BOTTOM LANDS

The bottom lands of Wayne County consist of Eel silt loam and the silt loam, loam, and fine sandy loam members of the Genesee series.

The greatest difficulty in the management of these soils is to provide adequate drainage and to prevent damage from flooding. The heavier areas should be tiled wherever suitable outlets can be obtained so that surplus water may drain away more readily. With the exception of some areas of Eel silt loam and Genesee fine sandy loam, these soils are well enough supplied with organic matter and nitrogen. On the light-colored areas which lack these constituents, provision should be made for increasing the organic-matter and nitrogen supplies by applications of manure and by the incorporation of other organic materials, such as crop residues and specially grown cover crops or intercrops. Liming is not required.

Most of this land is best adapted to corn; but wherever excess water is not troublesome, some other crops, such as wheat, clover, and soybeans, should be occasionally included in the cropping system.

Much of this land receives rich sediments from periodic overflows, and hence requires little fertilizer. The poorer areas, especially the loam and fine sandy loam soils, however, will respond to applications of available phosphates. All the bottom-land soils are also low in available potash and will respond to applications of potash fertilizer.

MUCK SOILS

Muck in Wayne County is of the nonacid type. Where sufficient drainage is provided so that the areas can be cultivated, their principal need is potash fertilizer. They are well supplied with nitrogen and phosphorus, but potash should be applied in liberal amounts in order to make muck and peat profitably productive.

O

[PUBLIC RESOLUTION—No. 9]

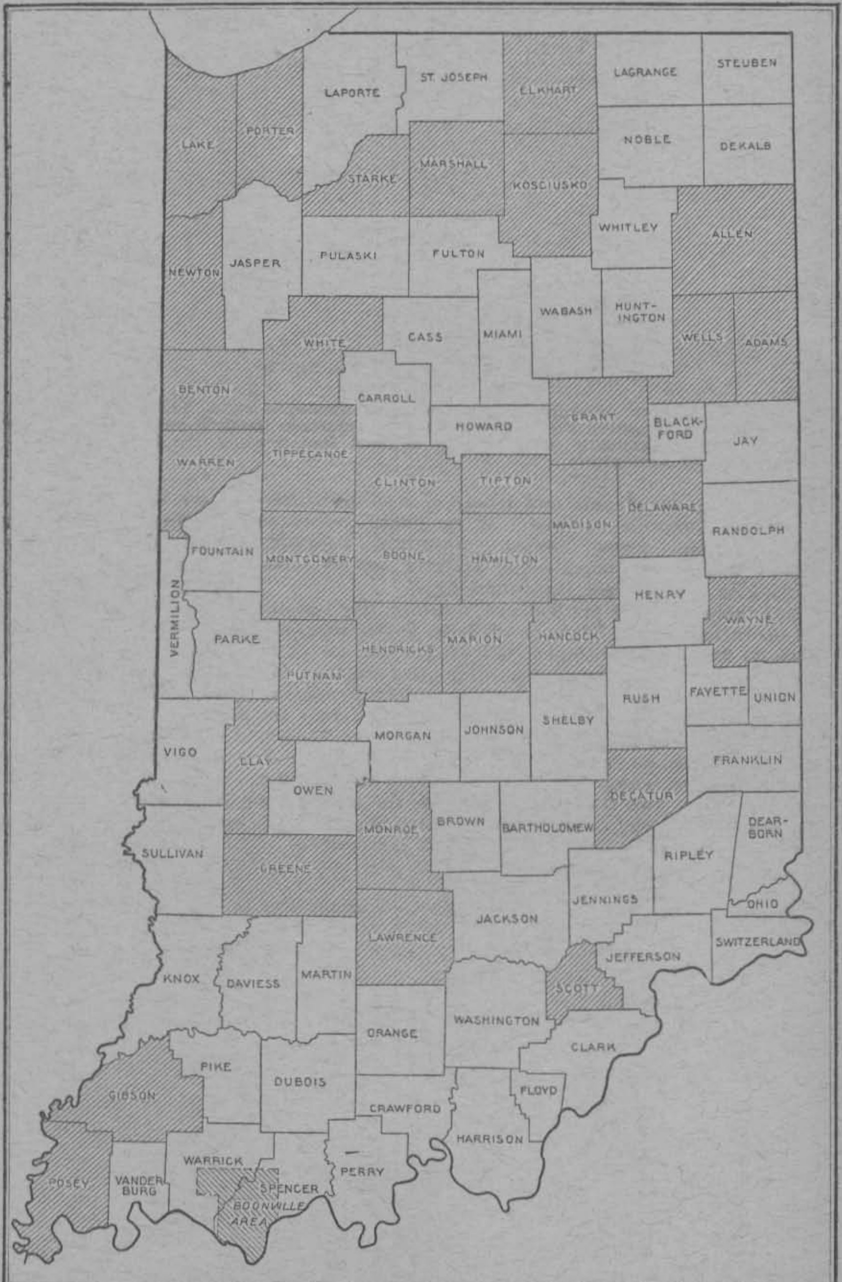
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



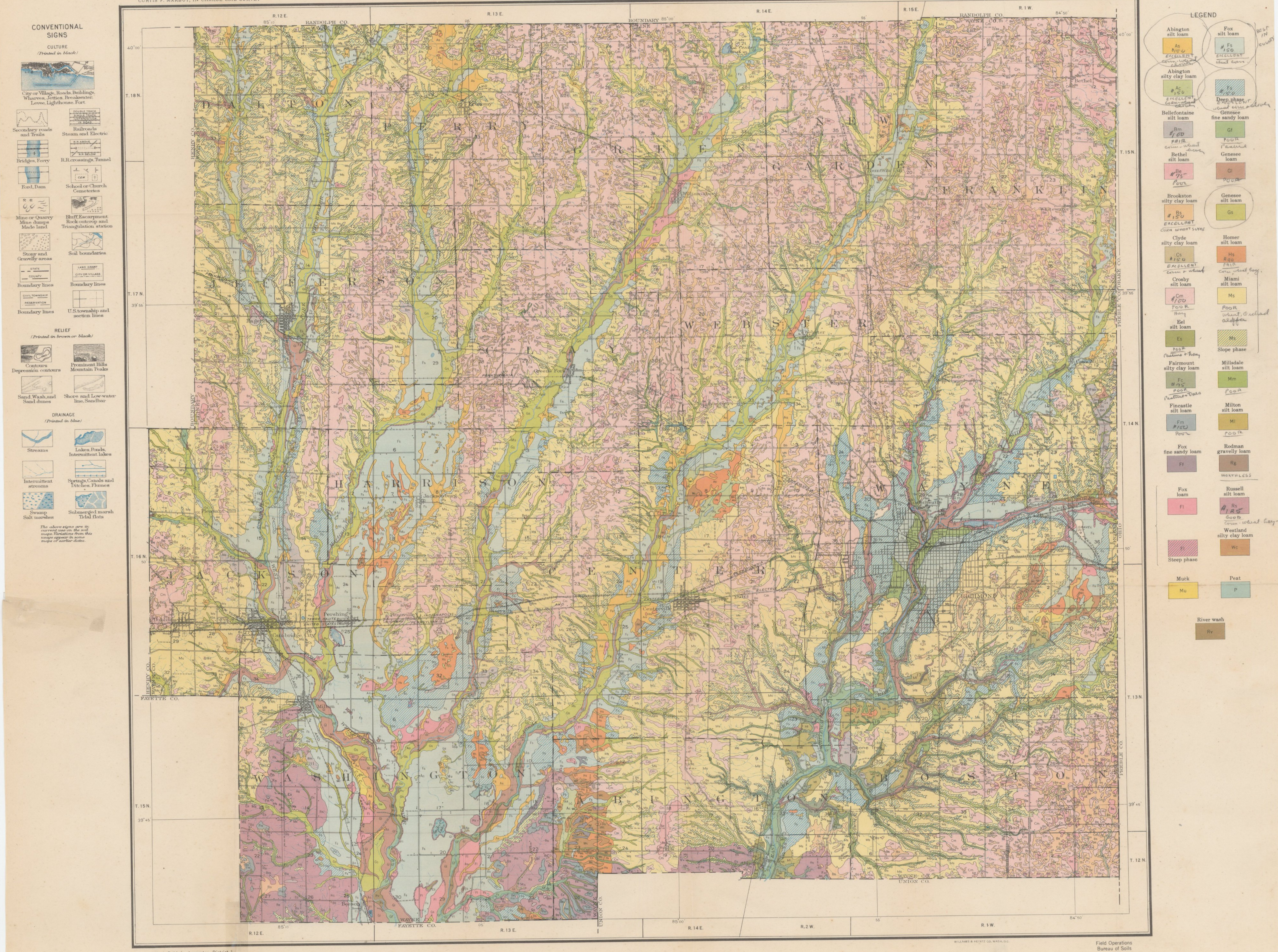
Areas surveyed in Indiana shown by shading

U. S. GOVERNMENT PRINTING OFFICE: 1930

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
A. G. McCALL, CHIEF, SOIL INVESTIGATIONS
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
WAYNE COUNTY
INDIANA

PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
G. I. CHRISTIE, DIRECTOR
A. T. WIANCKO, CHIEF, DEPARTMENT OF AGRONOMY
T. M. BUSHNELL, ASSOCIATE IN SOIL SURVEY



Mark Baldwin, Inspector, District 1.
Soils surveyed by T. M. Bushnell, in charge, and F. E. Barnes, Purdue University Agricultural Experiment Station and Earl D. Fowler and James Thorp, U. S. Department of Agriculture.

Scale 1 inch - 1 mile

1 ½ 0 1 2 3 4 Miles

WILLIAMS & HEINTZ CO. WASH. D.C.

Field Operations
Bureau of Soils
1925