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SOIL REPORT No. 59

MARSHALL COUNTY SOILS

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"It must be remembered that the productive power of the soil is the basic support of all prosperity."

C. G. HOPKINS

"It is the duty of every landowner to see that his land when he leaves it is as good or better than when he received it."

J. G. MOSIER

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INTRODUCTORY NOTE

IT IS A MATTER of common observation that soils vary tremendously in their productive power, depending upon their physical condition, their chemical composition, and their biological activities. For the most advantageous utilization of the land a definite knowledge of the existing kinds or types of soil is a first essential, and for any comprehensive plans for the improvement and the maintenance of our agricultural soils this knowledge is likewise necessary. It is the purpose of a soil survey to classify the various kinds of soil of a given area in such a manner as to permit definite characterization for description and for mapping. With the information that such a survey affords, every farmer or landowner of the surveyed area has at hand the basis for a rational system of improvement of his land. At the same time the Experiment Station is furnished an inventory of the soils of the state upon which intelligently to base plans for those fundamental investigations so necessary for solving the problems of practical soil improvement.

This county soil report is one of a series reporting the results of the soil survey which, when completed, will cover the state of Illinois. Each county report is intended to be as nearly complete in itself as it is practicable to make it, even at the expense of some repetition.

While the authors must assume the responsibility for the presentation of this report, it should be understood that the material for it represents the contribution of a considerable number of the present and former members of the Agronomy Department working in their respective lines of soil mapping, soil analysis, and experiment field investigation.

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MARSHALL COUNTY SOILS

By Eric Winters, Jr., R. S. Smith, and L. H. Smith[1]

GEOGRAPHICAL FEATURES

MARSHALL COUNTY, located in the north-central part of Illinois, has a total area of 393 square miles, or 352,500 acres. Illinois river flows from northeast to southwest, separating the county into approximately a western one-third and an eastern two-thirds. The chief town on the west side of the river is Henry. Lacon, on the east side of the river, is the county seat.

Transportation facilities are excellent thruout the county. Paved roads are well located and many of the secondary roads are graveled. Railroads serve every

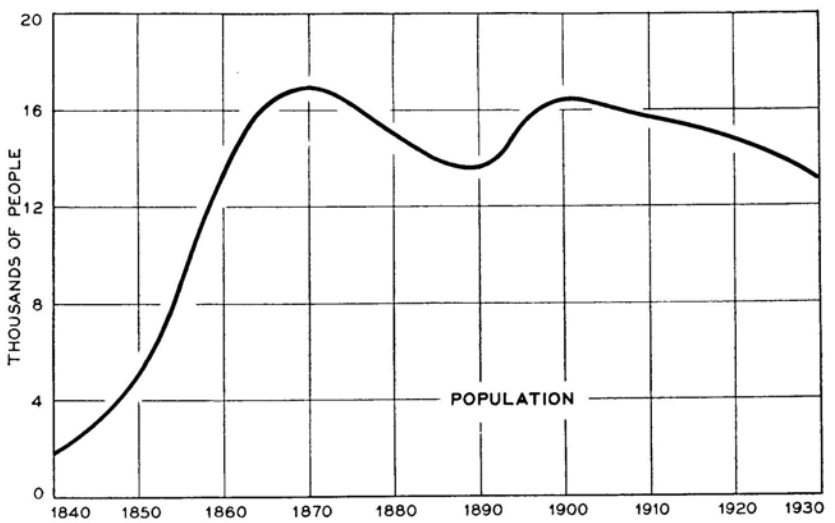

Fig. 1.—Growth of Population in Marshall County

At the time of the last U. S. Census in 1930 Marshall county had a population of about 13,000 persons. The maximum population was reached in about 1870, when the U. S. Census recorded 17,000 inhabitants.

town, providing convenient centers for stock and grain shipments. Some freight is handled by boats on Illinois river.

Marshall county was officially organized in 1839. Two of the early settlers were Colonel John Strawn and Jesse Roberts, who came to the region with their families about 1828. The land on the edge of the timber was first occupied, probably because of the better drainage and the convenience in procuring timber for buildings and firewood. For some years Hennepin, in Putnam county, was the chief trading center.

The population of the county grew rapidly until 1870, when a maximum of 17,000 was reached (Fig. 1).

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Agricultural Production

Tho a large proportion of Marshall county is well adapted to grain crops, yet there are sizable areas of rolling to steep land adjacent to Illinois river and its larger tributaries which are best suited for permanent pasture or timber. According to the U. S. Census for 1934, there were 27,000 acres in woodland and woodland pasture in the county. The land devoted to these purposes occurs for the most part in the rolling and steep areas mentioned above.

Corn has long been the major crop in Marshall county. Eighty-four thousand acres were devoted to its production in 1936, according to the Illinois Cooperative Crop Reporting Service. In the same year 37,600 acres of oats were raised. Wheat is of minor importance, the acreage being recorded as 3,500, and tame

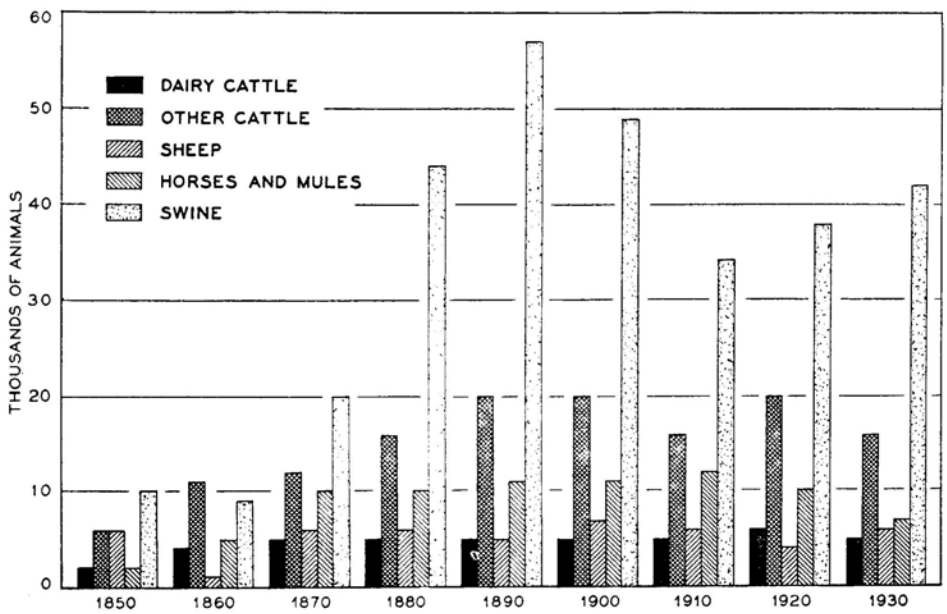


FIG. 2.—PRODUCTION OF PRINCIPAL CLASSES OF LIVESTOCK IN MARSHALL COUNTY

The number of dairy cattle has remained practically stationary at about 5,000 head since 1870. Other cattle increased up to 20,000 in 1890, but since 1900 the number has declined. A moderate interest in sheep has remained fairly constant for about seventy years, the number never exceeding about 7,500. Hog production reached its peak in 1890 and since then has declined, the 1930 figure being about 45,000 head. The decline in horses in the last twenty-five years is in accord with the trend toward mechanical power. *(Figures from U. S. Census)*

hay is given as 18,400 acres. The rapidly increasing popularity of the soybean brought the culture of this crop up to 12,500 acres in 1936.

Two other legumes that are now properly receiving increasing attention are sweet clover and alfalfa. In 1934, 2,700 acres of alfalfa and 5,000 acres of sweet clover were grown. Fruits and vegetables are of little commercial importance in Marshall county.

Tenantry early assumed significant proportions, and in 1880 about 40 percent of the farms were tenant-operated. By 1900 approximately 60 percent were

tenant-operated and since then the proportion has remained near that figure. The large amount of feed grains and hay available apparently encouraged livestock raising in spite of the large percentage of tenants, for the number of cattle and hogs increased rapidly up to 1890, as shown in Fig. 2. The decrease in the number of horses since 1910 parallels the general trend of the horse population thruout the country during this period. Sheep have averaged about 5,000 and poultry 130,000 during the last forty years. Milk cows represent about 5,000 of the total number of cattle.

Climate

The climate of Marshall county is typical of that prevailing in north-central United States, there being a wide range in temperature and an abundant rainfall. The following data are from the Pontiac weather station located about 15 miles east and a little south of the southeast corner of the county, and representing an observation period of twenty years, 1916 to 1935.

The highest temperature recorded was 107° F. in July, 1934; the lowest, 24° F. below zero in January, 1927. The average date of the last killing frost in the spring is April 26; the earliest in the fall, October 13. This gives an average growing season of 170 days. The latest recorded killing frost in spring was May 25, 1925; the earliest in fall was September 16, 1916. The shortest growing season was 138 days, in 1925; the longest, 209 days, in 1931. It is only in the exceptional year, when planting is delayed by wet weather, that an early frost is apt to damage the corn crop.

The average precipitation during the same period was 32.7 inches, which includes the water melted from the average snowfall of 27.2 inches, about 10 inches of snow being equivalent to one inch of rain. The wettest year was 1927, with 47.4 inches of precipitation; the driest, 1925, with 21.7 inches.

Of more interest than the total rainfall is the amount and distribution during the growing season. The monthly averages are as follows: April, 3.5; May, 3.4; June, 3.6; July, 2.5; August, 2.8; September, 3.7; giving a total of 19.5 inches for the average growing season. This appears to be a very favorable distribution. However, analysis of the daily records shows that in the twenty years under consideration there occurred 54 rainless periods of 20 days or more. A rainless period is defined as an interval during which no precipitation exceeding one-half inch was recorded in any 24-hour period. Of these 54 rainless periods, 28 exceeded 30 days in length, and 4 exceeded 60 days. Approximately half the drouths came in June, July, and August, when moisture is so vital to the development of corn.

Undoubtedly intervals of 60 days without appreciable rain will adversely affect crop yields, and such conditions may be expected one year in five. The effect of shorter rainless periods will depend on the kind of crop and its stage of development, the character of the soil, the moisture content of the soil before the rainless period, and on climatic conditions such as relative humidity, wind, and temperature. A combination of climatic conditions that results in crop failure on one soil may cause but moderate reduction in yield on another whose properties enable it to supply moisture to the crop for a longer period. Drouth resistance is an important property to consider in this region when evaluating a soil or planning a rotation for it.

Topography and Drainage

The portion of Marshall county west of Illinois river is gently rolling and in general well drained. The only important moraine extends in a north-south direction along the western boundary of the county. From Lawn Ridge to Camp Grove it is very prominent, but towards Broadmoor the outline of the moraine becomes less noticeable.

East of the river the topography is more level, and except for a small ridge at Varna most of the relief is due to stream erosion. Drainage is adequate, tho somewhat slow in places owing to the slight fall of many of the smaller ditches.

Headwater erosion has been active in dissecting the land along the river and for a short distance back along the major streams, notably along Sandy creek and Crow creek. There is but little bottomland along Illinois river in Marshall county, and much of what little there is, is swampy. The small stream bottoms are subject to overflow during rainy periods. Appreciable amounts of terrace occur at Henry and Lacon, particularly at Henry.

All the streams of the county empty into Illinois river except the two starting just below Camp Grove, which empty into Spoon river. Elevations above sea level for several points are recorded as follows: The river level is about 443 feet and the top of the moraine at Lawn Ridge is 825 feet, which gives a total difference in elevation of nearly 400 feet. The general average elevation over the county runs from 600 to 700 feet, which still allows enough fall to make erosion a serious problem near the main drainage channels.

FORMATION OF MARSHALL COUNTY SOILS

Origin of Soil Material

The parent material from which the upland soils of Marshall county have developed was deposited during the Glacial period. The bottomlands consist of soils developed from sediments derived from the glacial material thru erosion and deposition by streams.

The Glacial epoch was marked by several changes in climate. During the cooler periods vast quantities of snow and ice accumulated in the northern regions of the continent. These accumulations moved outward in a general southerly direction until a point was reached where melting was rapid enough to stop further progress.

The tremendous force of the advancing ice leveled off hills, gouged out basins, and gathered up the resulting debris, and carried it along, sometimes for hundreds of miles. When a warmer period occurred the ice would melt, depositing the rock fragments and other debris, much of which has been ground very fine, on the surface as a heterogeneous mixture, called by geologists "till" or "boulder clay."

As the glacial ice melted, the water carried large quantities of sediments away from the ice front. The coarse material was deposited close to the ice front, forming the outwash deposits so commonly found at the base of moraines. Much of the fine silty material was swept along to the rivers, where it was deposited in the bottomlands. As the high waters receded, this fine material dried out and

was then carried by the wind over the adjacent upland, forming deposits of uniform texture called "loess." No doubt other sources have contributed lesser quantities toward these loess deposits, as the dust storms of 1934 suggest.

The ice advanced and retreated a number of times, some warm intervals between ice advances being long enough to permit the development of a soil profile, while other of these intervals were so short that no appreciable soil weathering occurred. In Marshall county the upper till was deposited by advances of the Wisconsin Glaciation. It is represented by two apparently distinct, tho nearly contemporaneous advances. The first was of major importance, cover-

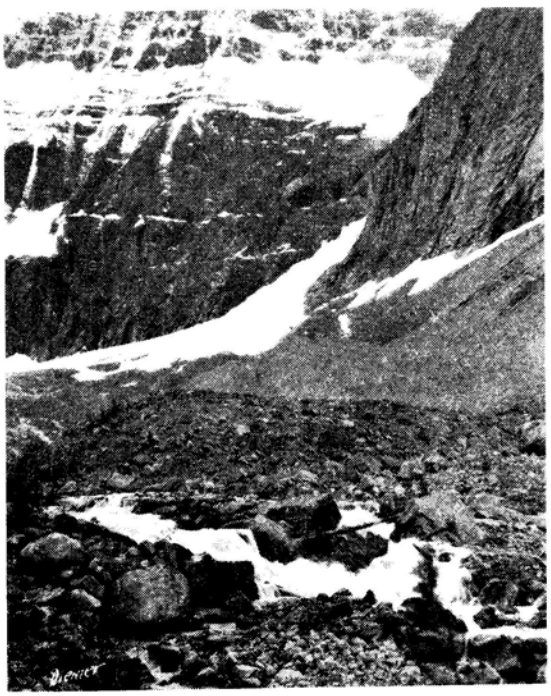


FIG. 3.—A PRESENT DAY GLACIER

Compared with the glaciers of the ice age, which covered large portions of a continent, this one confined to a mountain top in the Rockies, might be considered almost a miniature. It displays, however, the outstanding features of a glacier. The vast expanse of flowing ice, the melting edge, the streams of water running off with their loads of silt and sand, the rocks of all sizes which have been transported and deposited,—all are represented in the scene.

ing the entire county. The till left from this advance is a pinkish, moderately friable material. The second advance appears to have moved in from the northeast, covering only the eastern portion of the county. The material of this later movement is yellowish gray and plastic. At the town of LaRose it forms a layer a foot or less thick on top of the older, pink till. Further to the west and southwest the gray plastic till is absent but to the east and north it thickens rapidly.

The silty deposit of loess lies directly on unleached till thruout the county, indicating that a very short time intervened between the retreat of the ice sheet and the beginning of loess deposition. The loess is 20 feet or more thick along the

Illinois river bluffs, and thins out in a gradual but irregular manner in both directions from the river until, along the east and west county lines, it is only about 3 feet thick. The thickness of the loess and the character of the underlying till, with particular reference to permeability, are important in determining the behavior of the soil in respect to drainage. Loess is a very good soil-forming material because of its desirable texture and original high lime and plant-nutrient content. Glacial till may or may not be a desirable soil parent material. In Illinois it varies in this regard, in some regions being too open and pervious and in others too slowly pervious. The latter condition occurs in eastern Marshall county where, unfortunately, the loess is so thin as to make the character of the till an important factor in influencing the agricultural value of the soils developed on it.

How the Soils Were Developed

Immediately upon deposition the parent material was subjected to the action of the weathering forces, initiating the processes of soil development. Since the weathering forces are most active near the surface, and decrease in activity

FIG. 4.—STUDYING THE SOIL PROFILE

One of the very pronounced characteristics observed in most soils is that they are composed of more or less distinct layers, or strata, often spoken of in soil literature as "horizons." The vertical section of the soil showing the arrangement of these horizons from the surface down is called the "soil profile."

with increasing depth, various degrees or stages of weathering occur at different depths. Thus carbonates are first leached from the surface, and decomposition of the minerals is most active near the surface. Likewise organic matter accumulates in the surface soil much more than in the deeper horizons, as indicated by the darker color of the upper horizons. Thus gradually horizons are formed and the parent material acquires characteristics that permit it to be called a soil.

As the time of weathering lengthens, the soil characteristics become more

clearly developed and the horizons more easily distinguished. Making an analogy to the growth of a human being, the soil may be said to be progressing from infancy toward youth and finally to maturity and old age. The characteristics of an undeveloped or youthful soil are largely determined by the parent material. As weathering continues, the influence of parent material on soil character decreases. It is therefore of more importance to know something about the materials from which the soils were developed in a region of youthful soils than in a region of old soils.

The soils of Marshall county are all in various stages of youthfulness, as evidenced by the shallow depth of leaching. Thus it would be expected that the minerals have undergone but moderate decomposition and that the degree of acidity is not yet excessive. Consequently parent material is still an important factor and deserves close attention in evaluating the soils of this county.

The course of soil development is determined in part by the character of the vegetation occupying the land. It is probable that a grass vegetation became established in Illinois after the retreat of the glaciers and persisted thruout the state until replaced by forest, which encroached on the grassland in some parts of the state, particularly along streams. Prairie grass has an extensive, fibrous root system which decays slowly because protected from the air and which, when decayed, leaches slowly because of being nonacid or only slightly acid. As a result of these conditions organic matter accumulated in the grassland soils and they became dark in color. The dark color persisted until either forest invaded the grassland or until, because of long continued weathering and leaching, the grassland soils became strongly acid and therefore lost their organic matter.

Trees, in contrast to grass, have coarse roots which, upon decay, add but little organic matter to the soil. Moreover the forest litter is exposed to the air and is therefore subject to rapid and complete decay, so that this material also contributes but little organic matter to the soil.

Vegetation, therefore, as indicated above, is an important factor in influencing soil character. Grass promotes organic-matter accumulation and retards the action of the weathering forces, while forest favors organic-matter destruction and accelerates the action of the weathering forces.

Topography is another factor which influences the course of soil development. It not only determines in part the proportion of the rainfall lost by runoff, but it also influences the amount and character of the movement of the water in the soil. The moisture conditions within the soil have an important bearing on soil development.

Thus we see that under influences which vary as much as do climate, vegetation, topograhy and parent material, various kinds of soils are formed. The above brief discussion is intended to remove the mystery concerning the occurrence of very dissimilar soils adjacent to each other.

SOIL CLASSIFICATION AND MAPPING

The soil type is the unit of classification for soil survey work. A given soil type has the same horizon sequence and the same range in horizon properties, such as color, texture, etc., wherever it may occur. Differences in management

may have brought about variations in the present productivity of two areas of the same type, yet both retain the same potential productive capacity.

It is important to emphasize the fact just mentioned, that a soil type includes a range in properties. One of the most difficult tasks in mapping soils is to recognize all variations that are of agricultural significance, and at the same time to avoid the introduction of unnecessary, confusing details. The limits of variation allowable within a type thus demand continual attention, first, to define them properly, and second, to make sure that the accepted limits are observed as the mapping progresses.

Each soil type is given a number in addition to the name to facilitate its designation on the map. The type names and numbers for Marshall county are listed in Table 1 and the area of each type in the county given. The accompanying soil map is in two parts: the base map was drafted from State Geological Survey data, and the outlines of lakes, swamps and of Illinois river were taken directly from the topographic sheets.

TABLE 1.—MARSHALL COUNTY SOILS: AREAS OF DIFFERENT SOIL TYPES

Type No.	Type name	Area in square miles	Area in acres	Percent of total area
17	Berwick silt loam	6.74	4 314	1.71
18	Clinton silt loam	35.13	22 483	8.89
23	Blount silt loam	5.86	3 750	1.48
24	Miami silt loam	7.27	4 653	1.84
25	Hennepin gravelly loam	21.92	14 029	5.55
36	Tama silt loam	48.45	31 008	12.27
37	Worthen fine sandy loam, bluff wash	2.47	1 581	.63
41	Muscatine silt loam	97.00	62 080	24.56
43	Grundy silt loam	2.35	1 504	.60
60	LaRose silt loam	2.48	1 587	.63
63	O'Neill sandy loam, terrace	2.23	1 427	.56
65	Grundy clay loam	12.38	7 923	3.14
67	Harpster clay loam	2.19	1 402	.55
73	Huntsville loam, bottom	24.02	15 373	6.08
79	O'Neill silt loam, terrace	16.48	10 547	4.18
81	Littleton silt loam, terrace	3.04	1 946	.77
87	Sumner sandy loam, terrace	2.49	1 594	.63
137	Ellison silt loam, terrace	4.89	3 130	1.24
145	Saybrook silt loam	23.31	14 918	5.90
146	Elliott silt loam	30.93	19 795	7.83
148	Proctor silt loam	.71	454	.18
149	Brenton silt loam	1.07	685	.27
152	Drummer clay loam	25.22	16 141	6.39
185	Clinton sandy loam	.83	531	.21
209	Ellison sandy loam, terrace	.07	45	.02
210	Harpster muck	.14	90	.04
222	Huntsville gravelly loam, bottom	.13	83	.03
223	Varna silt loam	.73	467	.18
	Miscellaneous			
	Water and swamp	14.23	9 106	3.60
	Gravel pits, mine dumps, etc.	.17	121	.04
	Total	394.95	252 768	100.00

SOIL TYPES OF MARSHALL COUNTY, THEIR USE, CARE, AND MANAGEMENT

Twenty-eight soil types have been recognized in Marshall county. A brief description of each type, together with recommendations for its use and management, is presented in the following pages. A summary of this information, including only the more important characteristics, together with the relative suitability or "rating" of each type for crops, pasture, and timber, is given in Table 2 on page 27 of this report.

Much useful information concerning soil management that is available elsewhere will not be repeated in detail in this report. Directions for determining the lime and phosphorus requirement of soils are given in Circulars 346 and 421 respectively.[1] These circulars should prove valuable to anyone contemplating the use of either limestone or a phosphatic fertilizer.

Berwick silt loam (17)

Berwick silt loam is a light-colored soil that has developed on nearly level to undulating topography in areas where the loess is 50 inches or more thick. It is distributed thruout the central and southwestern parts of Marshall county near the streams, in association with Clinton silt loam (18), and it occupies less than 2 percent of the area of the county.

The surface is a brownish-gray structureless or indistinctly granular silt loam containing numerous black pellets. The subsurface begins at 6 to 8 inches and is a structureless yellowish-gray silt loam in its upper part and gray in its lower part. The subsoil, which starts at 14 to 18 inches, is a yellowish-gray plastic clay loam slowly permeable to water. Below 35 inches the material becomes more friable, and at 50 to 60 inches carbonates are present.

Use and Management.—Tho subdrainage is slow, this soil type usually occurs in relatively narrow areas not far removed from gullies into which drainage water can be carried by means of open ditches and furrows. This soil is acid and low in organic matter. It is probably better adapted to timber than to cropping, but if it is already cleared, fair pasture and small grain crops can be grown in average seasons if good farming practices have been followed in the past. Satisfactory yields can be secured only thru the use of limestone, followed by the growing of clover or the application of manure.

Clinton silt loam (18)

Clinton silt loam is a light-colored soil that has developed on moderately sloping topography in areas where the loess is 50 inches or more thick. It occurs chiefly along the larger streams and represents the most extensive forest soil in Marshall county, covering all told more than 35 square miles. It is acid and low in organic matter.

The surface soil is a grayish-yellow indistinctly granular silt loam. The subsurface, beginning at 7 to 8 inches, is more distinctly yellow than the surface

[1]These and other publications of the Experiment Station may be obtained free of charge, on request.

and shows little indication of a definite structure. In texture it is silt loam and, where there is but little slope, the yellow color is not pronounced. The subsoil, beginning at 18 to 20 inches, is a drabbish-yellow medium-compact and medium-plastic silty clay loam. Below about 35 inches the material is friable, and between 50 and 60 inches it is calcareous.

Use and Management.—Both surface drainage and underdrainage of Clinton silt loam are good. The steeper slopes are best adapted to timber or pasture. It is particularly important to protect the heads of gullies in some way, in order to prevent them from cutting back into the more level-lying upland.

Tho not naturally a productive soil, Clinton silt loam responds well to treatment. The first step in a program to increase yields is to correct the acidity thru the application of limestone. Following this a good rotation should be adopted, including the frequent growing of crops of either clover or alfalfa. Phosphorus may soon become deficient, especially if legumes are grown, but the test for available phosphorus described in Circular 421 should not be neglected even now. This soil also responds well to manure, but the application of manure should be preceded by the limestone treatment; otherwise its full value will not be realized.

Blount silt loam (23)

Blount silt loam, embracing about 6 square miles, is distributed in small areas in different parts of the eastern half of Marshall county. It is a light-colored soil that has developed on rolling to strongly rolling topography. The parent material is a thin cover of loess (less than 40 inches) on gray, plastic, calcareous till.

The surface is a yellowish-gray silt loam 3 to 7 inches thick. The subsurface is grayish yellow. The subsoil, beginning around 8 to 15 inches, is a brownish-yellow medium-plastic clay loam often containing pebbles. The depth to carbonates is 35 inches or less, depending on the amount of erosion that has occurred.

Use and Management.—This soil is acid and low in organic matter. Because of the relatively rough topography and slow underdrainage, erosion is serious following cultivation, and failure to control erosion by means of a good vegetative cover results in the rapid deterioration of this soil to a point where its use for any purpose is difficult. Timber is the best cover to use, tho pasture may prove satisfactory if not overgrazed.

Miami silt loam (24)

Miami silt loam is a light-colored soil that has developed on rolling to strongly rolling topography along the major stream courses. It is acid and low in organic matter. The parent material is a thin cover of loess (less than 40 inches) on friable calcareous till. This type covers altogether about 7 square miles.

The surface, 4 to 7 inches thick, is a yellowish-gray silt loam. The subsurface is grayish yellow. The subsoil, beginning at 9 to 15 inches, is a grayish-yellow silty clay loam. Carbonates are found at 35 inches or even closer to the surface.

Use and Management.—Tho the subdrainage of Miami silt loam is good, many of the slopes are too steep to be used for cultivated crops without serious erosion

occurring unless special precautions are taken to decrease the runoff. The soil is acid and low in organic matter. Permanent pasture or perhaps timber is suggested as a suitable use for this soil, tho alfalfa and clover should grow satisfactorily if limestone is applied. Experiment-field results indicate that this soil responds well to phosphorus fertilization.

Hennepin gravelly loam (25)

Hennepin gravelly loam occurs on very rolling to steep topography along streams. It covers about 22 square miles in Marshall county.

In a virgin forest area, where but little soil material has been lost by erosion, the surface soil is of a brownish-yellow color and is 3 to 5 inches thick. The subsurface is yellow, and the subsoil is a reddish-yellow gravelly material, beginning at 6 to 10 inches. Calcareous till is usually near the surface and in many places has already been exposed by erosion.

Use and Management.—Timber is the best cover for Hennepin gravelly loam, tho some of it may be used for permanent pasture provided overgrazing is avoided. If cultivated, it is immediately subjected to destructive erosion.

Tama silt loam (36)

Tama silt loam is a dark-colored soil developed on moderately sloping topography in areas where the loess is 50 inches or more thick. It is the second most extensive soil in Marshall county. It is distributed fairly well thruout the county and covers altogether nearly 50 square miles. The soil is medium acid and medium in organic matter.

The surface, 5 to 7 inches thick, is a brown to light-brown silt loam. The subsurface is brownish yellow. The subsoil begins at 9 to 16 inches and is a reddish-yellow silty clay loam. The profile of this soil is friable thruout and absorbs water readily. Calcareous material usually occurs about 50 inches beneath the surface.

In the eastern part of the county, beginning near the town of Varna, the loess thins toward the east in a very irregular manner. Within a few rods it may vary in depth as much as 20 inches. Since the underlying till in this part of the county is slowly permeable, the soil developed on the areas of shallow loess will tend to resemble Elliott silt loam, No. 146, in certain features. This area of thin loess, representing a transition region with respect to soil type, is designated on the map by diagonal blue hatching.

West of Illinois river the situation is different, first because the underlying till is friable, and second, because the moraine which runs north and south along the western edge of the county marks a fairly sharp separation between the soil types developed on the deeper loess and those developed on the shallow loess. In general, this soil as it occurs west of the river averages higher in productivity than does the same type east of the river, because of the better underlying till west of the river.

Use and Management.—Tama silt loam is a satisfactory general-farming soil if given good treatment and management. It should be tested for acidity, and limestone applied as indicated by the test. The frequent growing of legumes

to maintain the supply of organic matter and nitrogen, and to provide a cover crop to prevent erosion during the winter months, is necessary if this soil is to maintain a satisfactory productive level. Manure, as well as legumes, gives good results on this soil.

Tama silt loam is well adapted to alfalfa after the acidity has been corrected, and its use on the steeper slopes is a good erosion-control practice. Phosphorus may be needed to maintain a high productive level after legumes have been grown for a time.

Worthen fine sandy loam, bluff wash (37)

Worthen fine sandy loam, bluff wash, occurs as recent deposits of sediment along the base of river bluffs in the form of fans at the mouths of gullies. Its topography is undulating to moderately sloping. It is of minor importance since it covers only 2½ square miles.

This soil is extremely variable in character, the variations occurring in such small areas that they could not be shown on a map of the scale used. The color ranges from light to dark and the texture from silt to sandy loam, depending on the rate of flow of the stream carrying the sediment and on the kind of material deposited. Where the upland slopes from which the sediments are derived are not protected against erosion, coarse material may wash down in sufficient quantities to be very harmful.

Use and Management.—No general recommendations for use and management can be made because this soil is so variable.

Muscatine silt loam (41)

Muscatine silt loam is the most prevalent soil type in Marshall county. It is well distributed over the county and occupies, all told, nearly 100 square miles, or practically one-fourth of the total area. This type is a dark-colored soil developed on undulating to gently rolling topography in areas where the loess is 50 inches or more thick. It is higher in organic matter than is Tama silt loam, and varies in acidity from slight to medium.

The surface is a faintly granular brown silt loam 7 to 10 inches thick. The subsurface is yellowish brown and extends to 14 or 18 inches. The subsoil is a yellowish-brown silty clay loam that breaks into small subangular fragments. Carbonates usually occur at 40 to 60 inches. The profile is friable thruout and absorbs water readily.

As mentioned in connection with Tama silt loam, No. 36, the thickness of loess east of Varna is very irregular. The Muscatine in this region is also affected by variations in the depth to the underlying plastic till. Diagonal hatching on the map indicates the frequent occurrence of shallow loess areas on which a soil intermediate in properties between those of Muscatine and Elliott silt loams may be expected.

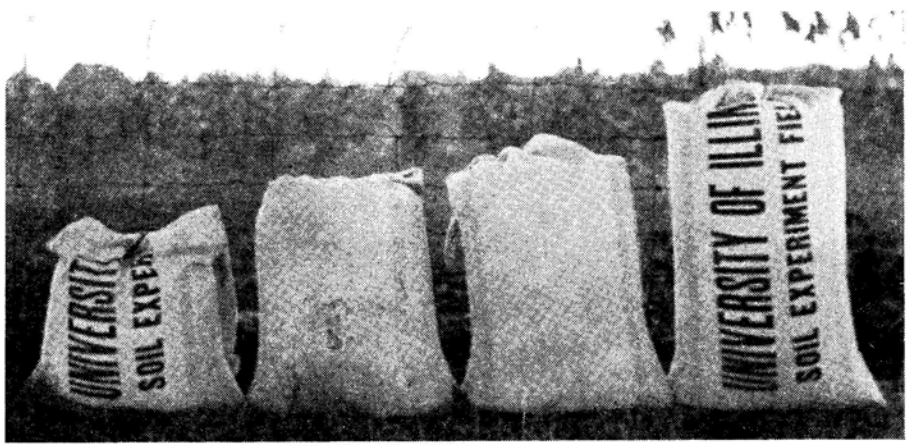
Use and Management.—All grain crops suited to the region do well on Muscatine silt loam. The use of manure or else the growing of clover is necessary in order to maintain the supply of organic matter and keep the productivity level high. This, however, is a more durable soil than is the Tama silt loam and

No limestone Limestone

FIG. 5.—ALFALFA ON MUSCATINE SILT LOAM

The plot at the left, receiving no limestone, yielded a total of 2.98 tons of hay an acre in the first three cuttings; whereas the plot at the right, which received 2 tons of limestone per acre, produced at the rate of 3.84 tons.

will stand more abuse without immediately disastrous results. A stand of red clover can usually be obtained in favorable seasons without limestone, but better growth is obtained after an application of limestone. Lime is necessary, however, for alfalfa and sweet clover (Fig. 5). After several years of clover, phosphate may be highly profitable on wheat (Fig. 6).



O 24 bu. M 31 bu. ML 36 bu. MLP 42 bu.

FIG. 6.—EFFECT OF SOIL TREATMENT ON WHEAT GROWN ON MUSCATINE SILT LOAM

The bags of wheat represent the 1936 harvest produced by different soil treatments on the Kewanee experiment field. The acre-yields, as a three-year average, were as indicated. Thus each additional fertilizer stepped up the wheat yields 5 to 7 bushels an acre.

Except for sheet erosion on a few of the slopes, little trouble is to be had from soil washing, particularly if good farming is practiced. Tiling of the nearly level areas is advantageous, and in wet years the beneficial effect of tile is especially noticeable.

Grundy silt loam (43)

Grundy silt loam is a dark-colored soil developed on nearly level topography in areas where the loess is 50 inches or more thick. Only two small areas of this type appear, one southwest of Whitefield and the other north of LaRose.

The surface is a dark-brown faintly granular silt loam 8 to 10 inches thick. The subsurface extends to 16 or 18 inches and is a little heavier in texture and sometimes darker in color than the surface. The subsoil is a brownish-drab clay loam having dark-coated angular-structured particles. The lower part of the subsoil is more friable, and at 40 to 60 inches free carbonates are present.

Use and Management.—Surface drainage is slow and erosion negligible because of the smooth topography. Underdrainage is good if a satisfactory outlet is available. When well drained, the soil is very productive and is adapted to all the crops common to the region. It is neutral to slightly acid in reaction, and it is high in organic matter.

Lime usually is not needed for red clover, tho it is advisable to test for acidity before seeding alfalfa or sweet clover. Regular use of manure or clovers should be made in order to provide a supply of fresh organic matter. Grundy silt loam is a productive, durable soil and needs only good farming and the growing of clovers or the application of manure to maintain a high productive level for many years. It should be realized, however, that eventually even this soil will need fertilizer treatment.

LaRose silt loam (60)

LaRose silt loam is a dark-colored soil developed on strongly rolling topography lying for the most part between LaRose and Washburn. The type may be thought of as an eroding or light phase of Saybrook silt loam, No. 145, tho the profiles of these two soils differ too much to take the same type name. It is medium to low in organic matter and medium acid. The parent material is friable calcareous till usually covered with a thin layer of loess, altho the latter may have been almost entirely washed away by erosion. The thickness of the loess cover depends on the amount of removal by erosion; it never exceeds about 20 inches and may be entirely absent.

The surface is a light-brown silt loam 3 to 6 inches thick, frequently containing pebbles. The subsurface is dull reddish brown and extends to a depth of 7 to 13 inches. The subsoil is a brownish-yellow silty clay loam containing pebbles. Free carbonates are present at 20 to 40 inches.

Use and Management.—Because of the rapid erosion that follows cultivation, this soil is not suited to corn and other grain crops, unless very carefully handled in a good rotation. Permanent pasture is recommended, and alfalfa does well following a light application of limestone. The chief difficulty in getting a good stand of alfalfa is in preventing small gullies from forming before the alfalfa is well enough established to control erosion.

O'Neill sandy loam, terrace (63)

O'Neill sandy loam, terrace, is a dark-colored soil developed on undulating to rolling areas of second bottomlands. It is found mainly in the northern part of Marshall county and occupies a total area of a little over 2 square miles. Stratified sand and gravel are close to the surface, or even exposed in some places, so that underdrainage is excessive and the soil is drouthy. Organic matter is low.

Use and Management.—This soil type is best suited to timber. No treatment can be recommended as profitable because of its drouthy nature.

Grundy clay loam (65)

Grundy clay loam is a dark-colored soil occurring in depressions, along drainage channels, and on large flats in regions where the loess is 50 inches or more thick. For this reason it does not occur in the extreme eastern and western parts of the county. The type covers altogether over 12 square miles. It is neutral to slightly alkaline in reaction and high in organic matter. Often small areas of Harpster clay loam, No. 67, are present in the Grundy clay loam.

The surface, which is 8 to 10 inches thick, is a black clay loam showing a definite granular structure. The subsurface, extending to a depth of 16 to 18 inches, is black to drabbish black. The subsoil is a yellowish-drab clay loam having dark-coated angular-structured particles, and in the lower portion there may be an occasional lime concretion. Carbonates occur at 40 to 60 inches.

Use and Management.—Surface drainage is slow and erosion is negligible. Underdrainage is good if a satisfactory outlet is available. When tiled, this soil is adapted to the crops common to the region, with the exception of alfalfa, which is apt to winterkill because of the high moisture conditions frequently prevailing in the spring and fall. Excellent corn yields are the rule. It is not primarily a small-grain soil, because of the tendency of the small grains to lodge. If sweet clover, which grows without the addition of lime, is plowed under every few years, it is doubtful whether other fertilization is advisable, at least for some years.

Harpster clay loam (67)

Harpster clay loam is a dark-colored soil that occurs chiefly in depressions in association with both Grundy clay loam, No. 65, and Drummer clay loam, No. 152. It is strongly alkaline and high in organic matter. Many areas are too small to be shown on the map but they are easy to recognize and should be looked for in clay-loam areas.

The surface, 5 to 10 inches thick, is a black clay loam that usually appears somewhat gray when dry, because of the large amount of shell fragments present. The subsurface and subsoil are a grayish-drab clay loam which usually, tho not always, contain shell fragments. Lime concretions are nearly always present somewhere in the profile. Some areas, tho alkaline, contain few and sometimes no shell fragments but have a horizon in which lime concretions are abundant. It is thought that in such cases the shell fragments have disappeared by becoming dissolved, and that the lime carbonate they contained has accumulated in the form of concretions. The agricultural properties of the soil in such areas are essentially the same as in areas containing shell fragments.

Use and Management.—Corn usually will not yield well on this type unless potash, manure, or straw is applied to counteract the harmful effects of alkali. The establishment of good drainage is of first importance. This is a good corn soil if treated as indicated above but it is not well adapted to the small grains.

Huntsville loam, bottom (73)

Huntsville loam, bottom, is a dark-colored soil that occurs on the first bottoms along the rivers and streams. All of its 24 square miles is subject to occasional or even frequent overflow, while much of that along Illinois river is swampy. It shows but little profile development and varies in character according to the recent sediments of which it is composed. In general it is silty in texture and medium to dark brown in color.

Use and Management.—Usually the small stream bottoms drain off early enough in the spring to allow a corn crop to be produced. The wetter areas will provide several months of good pasture each season. No treatment is suggested where there is frequent addition of fresh sediments during overflow. This is a good agricultural soil except for the hazard of overflow.

O'Neill silt loam, terrace (79)

O'Neill silt loam, terrace, is a dark-colored soil developed on the undulating to gently rolling second bottomland. Two large tracts occur, one at Henry and the other at Lacon, making up a total of 16½ square miles. Overflow seldom occurs, and when it does the water quickly recedes. The presence of a gravelly stratum at 25 to 35 inches causes rapid underdrainage, resulting in a drouthy condition.

The surface is a brown to light-brown silt loam, often containing appreciable quantities of sand. The subsurface, beginning at 5 to 8 inches, is a reddish-brown sandy silt loam. The subsoil starts at 12 to 16 inches and is a reddish-yellow silty clay loam containing sand and gravel. Coarse stratified sand and gravel is encountered at 25 to 35 inches.

Use and Management.—Winter and spring grain crops are better adapted to this soil than is corn, tho in wet seasons a fair yield of the latter may be expected. The soil is acid and medium in organic matter. Lime must be applied before alfalfa will grow. Since no method of treatment will prevent injury to crops during drouth periods, it is well to consider the limitations of this soil carefully before investing heavily in an attempt to improve it.

Littleton silt loam, terrace (81)

Littleton silt loam, terrace, is a dark-colored soil occurring on the nearly level to undulating second bottomlands. This is a minor type covering only about 3 square miles. The main body lies northwest of Henry. It is high in organic matter and neutral to slightly acid in reaction. The land is covered by overflow only during the highest floods, and then the water never remains for any great length of time.

There is some variation in this soil because of the differences in the character

of the alluvial sediments from place to place. In general, however, the soil profile resembles that of Muscatine silt loam, No. 41, except that at 50 inches or deeper a sand or gravel stratum is usually present.

Use and Management.—Littleton silt loam, terrace, is a good general farm soil, ranking slightly below Muscatine silt loam, No. 41. It is high in organic matter and neutral to slightly acid in reaction. It requires an application of limestone to grow alfalfa or sweet clover but will grow red clover fairly well without limestone. Acidity tests, however, should be made and limestone applied as indicated. A good rotation should be established and then tests for available phosphorus should be made. With these measures, and under good farming, very satisfactory yields may be expected.

Sumner sandy loam, terrace (87)

Sumner sandy loam, terrace, is a dark-colored soil occurring on second bottomland in the Illinois river valley. It is acid, and for a dark-colored soil it is low in organic matter.

The surface is a light-brown sandy loam about 7 inches thick. The subsurface is a pale reddish-yellow sandy loam which passes gradually into a grayish-yellow sandy loam to sand. The coarse texture of this soil provides good underdrainage; in fact, where the subsoil is sand, the underdrainage is rapid and the water-holding capacity is low, resulting in a tendency to drouthiness.

Use and Management.—This soil responds quickly to treatment but because of the coarse texture there is tendency for it to be leachy, making it unwise to attempt to build up a reserve of organic matter. Light applications of manure should be made at frequent intervals and rotations should be short, making frequent plowing down of clover possible. Because of the rapid subdrainage, crops on this soil are nearly as susceptible to injury in dry periods as those on O'Neill sandy loam, No. 63. This drouthy tendency limits the adaptation of this soil to spring grains and pasture crops altho alfalfa usually does well following the application of limestone. It is probable that phosphate should be applied when alfalfa is seeded. One of the difficulties in handling this soil is its tendency to drift with the wind.

Ellison silt loam, terrace (137)

Ellison silt loam, terrace, is a light-colored soil developed on second bottomlands. It covers about 5 square miles. It is acid and low in organic matter.

The surface is a grayish-yellow silt loam 5 to 7 inches thick. The subsurface is somewhat lighter in color and extends to a depth of 12 or 15 inches. The subsoil is a yellow silty clay loam. All horizons may contain appreciable amounts of sand. At a depth of 25 to 40 inches coarse sand and gravel are encountered.

Use and Management.—Underdrainage is rapid to excessive due to the presence of the coarse sand and gravel stratum near the surface and as a result crops suffer during protracted rainless periods. Because of the drouthy nature of this soil its best use is probably for timber. However, if already cleared, pasture and spring grain crops will do fairly well, but pastures dry up in mid-

summer and care should be used not to overgraze. Fertilizer treatment usually is not advisable because of the drouthiness that makes yields uncertain.

Saybrook silt loam (145)

Saybrook silt loam is a dark-colored soil developed on gently rolling to rolling topography. It occurs only in the extreme western part of Marshall county, where it occupies over 23 square miles. The parent material from which this soil was developed is loess and friable calcareous till. The loess blanket covering the till varies in thickness but never exceeds about 40 inches. The organic-matter content varies with the slope, being lower on the more strongly sloping areas. The acidity varies from slight to medium.

The surface, which is 3 to 7 inches thick depending on the amount of erosion, is a brown to light-brown silt loam. The subsurface is yellowish brown. The subsoil, which begins at 10 to 18 inches and which frequently contains a scattering

K N P 0

FIG. 7.—RESPONSE OF WHEAT TO PHOSPHORUS ON SAYBROOK SILT LOAM

Three of these four plots of wheat were treated respectively with potassium (K), nitrogen (N), and phosphorus (P). The fourth was left without fertilizer. Note how responsive the wheat was to the phosphorus treatment.

of pebbles, is a brownish-yellow silty clay loam that tends toward a reddish yellow on the more pronounced slopes. Carbonates occur at 25 to 45 inches.

Use and Management.—The rolling topography of Saybrook silt loam makes erosion a serious problem. Sheet washing and a few gullies, while not appearing harmful, rapidly lower the potential productivity of this soil to that of LaRose silt loam, No. 60, previously described. In the management of this soil constant effort should be made to avoid the loss of soil material by erosion. In some situations terraces are advisable, but they should always be supplemented by good soil-treatment and crop-management practices. A vigorous vegetation is essential for effective erosion control, and fortunately good growth is relatively easy to secure on this soil. Some slopes should be used for permanent pasture, as erosion has already gone too far to permit continuing cultivation. Alfalfa is a good

erosion-control crop, but difficulty is sometimes encountered in getting a good stand without the development of gullies while the alfalfa is young.

Elliott silt loam (146)

Elliott silt loam is a dark-colored soil developed on undulating to rolling topography. Most of it is found in the east half of the county. In extent it embraces more than 30 square miles. The acidity is slight to medium and the organic-matter content is medium. The parent material from which this soil was developed is plastic calcareous till covered by a loess blanket of varying thickness but never exceeding about 40 inches.

The surface, 5 to 8 inches thick, is a brown silt loam showing faint granular structures. The subsurface is a yellowish-brown silt loam extending to a depth of 12 to 18 inches. The subsoil is a rather plastic drabbish-yellow clay loam. Plastic calcareous till occurs at 25 to 40 inches beneath the surface. In places where the till comes closer to the surface, the subsoil is heavier and more plastic.

Use and Management.—Because of the rather slow underdrainage, sheet erosion and gullying are more serious than on soils underlain by a more permeable material. It is well to plan the rotation with this in mind, keeping a protective vegetative covering on the land as much of the time as possible. Fall plowing should be avoided, as fall-plowed land is easily eroded. It is questionable whether terracing is advisable on this soil; but more information is necessary before a definite statement can be made regarding the applicability of this type of erosion control to this soil.

Elliott silt loam is adapted to the crops common to the region tho it is not a highly productive soil. The acidity is slight to medium and the organic-matter content is medium. Red-clover growth is uncertain unless limestone is applied, and sweet clover requires an application of this material. Alfalfa, which will also probably need limestone, is handicapped somewhat by the slow underdrainage, tho usually not seriously so.

Proctor silt loam (148)

Proctor silt loam is a dark-colored soil developed on the undulating to gently rolling slopes of glacial outwash plains. The type has a very limited occurrence, a total of less than one square mile, and is found chiefly in the west half of the county.

The surface soil is a brown to light-brown silt loam 6 to 8 inches thick. The subsurface is a brownish-yellow silt loam and extends 14 to 18 inches below the surface. The subsoil is a brownish-yellow silty clay loam. At 40 to 60 inches in depth, stratified, sometimes calcareous, sandy material called outwash is encountered.

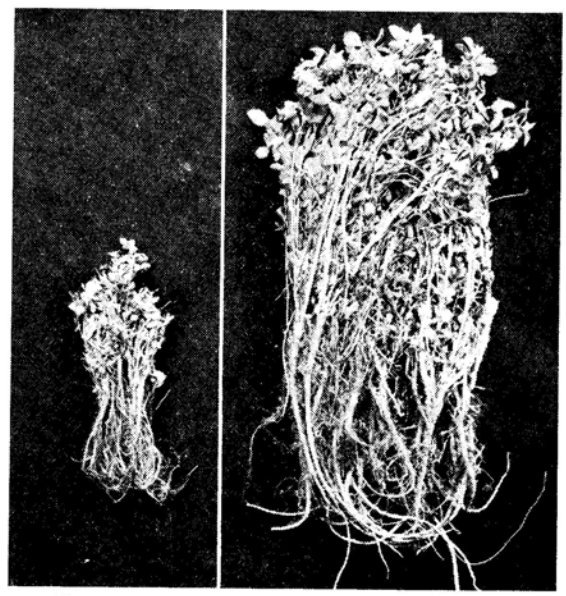
Use and Management.—Proctor silt loam, when well managed, is a good soil for general farming, but it will not stand abuse. It is medium acid in general, and medium in organic matter. It should be tested for acidity and limestone applied as indicated by the test, in order to grow clover at regular intervals. Underdrainage is good, and while there is some sheet erosion on the more pronounced slopes, reasonably good farming will usually take care of this problem. Follow-

ing the application of limestone, Proctor silt loam makes a good alfalfa soil, but it is probable that phosphate should also be applied for this crop.

Brenton silt loam (149)

Brenton silt loam is a dark-colored soil developed on the undulating topography of glacial outwash plains. Like Proctor silt loam, No. 148, with which it is associated, this type is also very limited in occurrence, embracing all told about one square mile in the central part of that portion of the county west of Illinois river. It is high in organic matter and slightly acid to neutral in reaction.

The surface is a finely granular dark-brown silt loam 8 to 10 inches thick. The subsurface extends to 16 or 18 inches and is a light-brown to drabbish-



No limestone Limestone

FIG. 8.—SWEET CLOVER DEMANDS LIMESTONE

These plants are from a second-year spring growth of sweet clover on the Kewanee experiment field. Each bundle is the growth from 4 square feet, the small one at the left having grown on unlimed soil, and the large one at the right on soil given a 2-ton application of limestone.

brown silt loam. The subsoil is a yellowish-drab silty clay loam that breaks into dark-coated angular- to subangular-structured particles. It is underlain at 45 to 60 inches by stratified glacial outwash which is frequently calcareous.

Use and Management.—Brenton silt loam is one of the best soils in Illinois, tho it is not quite so fertile a soil as some of the clay loams. In agricultural value and producing capacity it is comparable to Muscatine silt loam, No. 41, previously described. It is high in organic matter and slightly acid to neutral in reaction. Good farming, including the use of limestone where needed and the growing of clovers, will keep this soil in good producing condition for many years. Eventually fertilizer treatment with phosphate, and probably with potash, will be needed.

Drummer clay loam (152)

Drummer clay loam is a dark-colored soil occurring in depressions, along drainage channels, and on extended flats in regions where the loess is less than 40 inches thick. Thus it is found at some distance away from Illinois river. This type occupies about 25 square miles. In many places small areas of Harpster clay loam, No. 67, are present in the Drummer clay loam.

The surface soil is a well-granulated black clay loam about 10 inches thick and usually contains some pebbles. It is high in organic matter and in plant nutrients. The subsurface is a black clay loam with a drabbish cast, resting at about 18 inches in depth on a mixed gray and pale-yellow clay or clay loam. Beneath about 35 inches the material is more friable and more brightly colored with yellow.

Use and Management.—Drummer clay loam, if well drained, is a highly productive soil. It is high in organic matter and, being nonacid, it needs only good farming, including the growing of clover, to maintain a high productive level for many years. It is better adapted to corn than to the small grains as there is a tendency for the small grains to lodge.

Clinton sandy loam (185)

Clinton sandy loam is a light-colored soil developed on gently to strongly rolling topography. It occurs in places where the wind has carried sand from the sandy terraces and deposited it over the nearby upland. As a result, the sandy covering is variable in depth. It is found a short distance east of Lacon. The total area amounts to less than one square mile.

Use and Management.—Clinton sandy loam is acid and low in organic matter. It is not well adapted to the grain crops but will produce fair pasture and, if limestone is applied, alfalfa may be grown. It is probable, however, that to get good results with alfalfa, phosphate should be applied in addition to limestone. The steeper slopes should be kept in timber.

Ellison sandy loam, terrace (209)

Ellison sandy loam, terrace, is a light-colored soil developed on the second bottomland of Sandy creek. Only 45 acres are found in the county.

The surface soil is a yellowish-gray sandy loam 5 to 8 inches thick. The subsurface is more grayish than the surface and the subsoil, if development has taken place, is a slightly plastic, sandy, silty material. At depths varying between 15 and 30 inches a stratified sand and gravel layer occurs.

Use and Management.—Ellison sandy loam, terrace, is drouthy because of the underlying sand and gravel. It is acid and low in organic matter. It is not a good general-farming soil and is probably better adapted to timber than to any other use.

Harpster muck (210)

Harpster muck is a dark-colored soil developed in very small pond-like depressions found east of the river. Until very recent times it has been covered by shallow water; consequently little or no horizon development has taken place.

No limestone Limestone

FIG. 9.—ALFALFA ON SAND SOIL

At the right is a thrifty crop of alfalfa produced under proper soil treatment on the Oquawka experiment field, where the soil is classed as Dune sand. The yield on this plot was nearly 4½ tons for the season; whereas the adjacent plot, which was manured but received no limestone, yielded nothing but weeds.

It is extremely high in organic matter and alkaline in reaction. The total area in the county amounts to only 90 acres.

The surface is a brown to black mucky loam containing numerous shell fragments. The color becomes more drab with depth and at 30 inches or below the muck rests on sand, silt, or clay.

Use and Management.—Frequently it is impossible to drain this soil because of its low-lying position. If drained and cultivated, the surface slowly subsides as the organic matter decomposes, so that deepening of the outlets may become necessary.

Potash must be applied for the satisfactory growth of grain crops, particularly corn. This soil is not well adapted to the small grains because of the tendency for them to lodge.

Huntsville gravelly loam, bottom (222)

Huntsville gravelly loam, bottom, is an unimportant type covering only 83 acres just south of Lacon. It occurs on first bottoms that have recently cut thru terraces. With the removal of the silty upper stratum, the coarse stratified sand and gravel is exposed. No soil horizons have developed.

The soil is subject to overflow, and for the most part is also drouthy. Cultivation is usually not advisable.

Varna silt loam (223)

Varna silt loam is a dark-colored soil found on strongly rolling topography and developed from mixed loess and till on plastic calcareous till. It might be thought of as strongly rolling Elliott silt loam. It is found in several small tracts, amounting to 467 acres altogether, in the northeast and the southeast corners of the county.

In undisturbed areas the surface is a light-brown silt loam 2 to 5 inches thick. The subsurface is brownish yellow and extends to a depth of 5 or 10 inches. The subsoil is a brownish-yellow clay loam, which rests on yellowish-gray calcareous plastic till at 15 to 30 inches. On the steeper slopes not protected by vegetation the till in many places is exposed at the surface.

Use and Management.—Cultivation of Varna silt loam is followed by serious erosion, so that a permanent grass cover is advisable. The soil is medium acid and medium low in organic matter. On slopes not badly eroded, alfalfa, if successfully started, will do well. An application of limestone and phosphate should be made in preparation for this crop. It is also advisable to precede the alfalfa with a crop of sweet clover. Because some difficulty will be encountered in getting a good stand of alfalfa without the formation of gullies while the alfalfa is young, a preceding crop of sweet clover will help in getting the alfalfa established.

SUMMARY OF IMPORTANT CHARACTERISTICS OF MARSHALL COUNTY SOILS

A summarized statement of the agriculturally more significant characteristics of the soil types shown on the map is presented in Table 2. The columns headed "productivity indexes" are intended to give an idea of the relative producing capacity of the various soil types for the common field crops. Soils with ratings of 5 or lower for these crops are given ratings for pasture and timber also.

The scale used for expressing relative producing capacity for the common field crops is 1 to 10, in which 1 represents the soils of the state having the highest producing capacity and 10 those having the lowest. "Producing capacity" is defined as the capacity of a soil, when well drained and when farmed in a manner common to the region, to produce the crops of the region without the help of soil treatment. For timber and for pasture the letters A, B, and C are used as the rating scale, "A" representing the best and "C" the poorest.

In this connection it is recognized that soils differ in their capacity to respond to soil treatment, and that this difference is not brought out in Table 2. Clinton silt loam, for example, which rates 5, responds well to good soil-treatment and management methods; whereas, O'Neill silt loam, rating 7, is disappointing in its response. Since there would be many difficulties in trying to present satisfactorily this kind of information in simple index terms, the reader is referred to the management paragraph under each soil type for detailed discussion.

TABLE 2.—MARSHALL COUNTY SOILS: SUMMARY OF CHARACTERISTICS

Type No.	Type name	See page[1]	Topography[2]	Drainage[3]		Reaction	Available phosphorus	Organic matter	Productivity indexes[4]		
				Surface	Under				Field crops	Pasture	Forest
17	Berwick silt loam	11	Nearly level to undulating	Moderate	Slow	Acid	Low	Low	6-7	B	A
18	Clinton silt loam	11	Gently rolling to rolling	Mod. to rapid	Moderate	Acid	Low	Low	5	A	A
23	Blount silt loam	12	Rolling to strongly rolling	Rapid	Slow	Acid	Low	Low	6-7	B	A
24	Miami silt loam	12	Rolling to strongly rolling	Rapid	Moderate	Acid	Low	Low	5	A	A
25	Hennepin gravelly loam, eroded	13	Steep	Excessive	Moderate	.....	.....	Low	10	C	B
36	Tama silt loam	13	Rolling	Mod. to rapid	Moderate	Med. acid	Low	Medium	3-4	....	....
37	Worthen fine sandy loam, bluff wash	14	Undulating to rolling	Moderate	Moderate	Variable	Variable	Variable	3-6	....	....
41	Muscatine silt loam	14	Undulating to gently rolling	Moderate	Moderate	Med. acid	Medium	Med. to high	2	....	....
43	Grundy silt loam	16	Nearly level	Mod. to slow	Moderate	Sl. to neut.	Med. to high	High	1	....	....
60	LaRose silt loam	16	Strongly rolling	Rapid	Moderate	Medium	Medium	Medium	4	....	....
63	O'Neill sandy loam, terrace	17	Undulating to rolling	Mod. to rapid	Rapid	Acid	Low	Low	9	C	B
65	Grundy clay loam	17	Nearly level	Slow	Moderate	Neutral	Med. to high	High	1	....	....
67	Harpster clay loam	17	Nearly level	Slow	Moderate	Alkaline	High	High	4	....	....
73	Huntsville loam, bottom	18	Nearly level to undulating	Moderate	Moderate	Sl. to neut.	High	Med. to high	5	A	A
79	O'Neill silt loam, terrace	18	Undulating to gently rolling	Moderate	Rapid	Acid	Low	Med. to low	7	B	B
81	Littleton silt loam, terrace	18	Nearly level to undulating	Moderate	Moderate	Slight	Medium	High	2-3	....	....
87	Sumner sandy loam, terrace	19	Undulating to rolling	Moderate	Rapid	Acid	Low	Low	7-9	B	B
137	Ellison silt loam, terrace	19	Undulating to gently rolling	Moderate	Rapid	Acid	Low	Low	9	C	B
145	Saybrook silt loam	20	Gently rolling to rolling	Mod. to rapid	Moderate	Medium	Low to med.	Medium	3	....	....
146	Elliott silt loam	21	Undulating to rolling	Mod. to rapid	Slow	Medium	Low	Medium	4	....	....
148	Proctor silt loam	21	Undulating to gently rolling	Moderate	Moderate	Medium	Low	Medium	3	....	....
149	Brenton silt loam	22	Undulating	Moderate	Moderate	Slight	Medium	High	2	....	....
152	Drummer clay loam	23	Nearly level	Slow	Moderate	Neutral	High	High	1	....	....
185	Clinton sandy loam	23	Gently to strongly rolling	Mod. to rapid	Moderate	Acid	Low	Low	7	B	A
209	Ellison sandy loam, terrace	23	Gently rolling	Moderate	Rapid	Acid	Low	Low	9	C	B
210	Harpster muck	23	Nearly level	Slow	Moderate	Alkaline	High	Very high	5	B	B
222	Huntsville gravelly loam, bottom	24	Undulating	Moderate	Rapid	Variable	Low	Low	8-10	C	B
223	Varna silt loam	25	Strongly rolling	Rapid	Slow	Medium	Low	Low	6-8	B	A

[1]For description of soil type turn to page indicated.

[2]Topography is expressed by the following terms based upon the respective slopes: *nearly level*, less than .5 percent slope; *undulating*, .5 to 1.5 percent; *gently rolling*, 1.5 to 3.5 percent; *rolling*, 3.5 to 7 percent; *strongly rolling*, 7 to 15 percent; *steep*, greater than 15 percent.

[3]Of the terms used to express character of drainage, "moderate" indicates the most favorable drainage.

[4]The index number assigned to a soil type for production of field crops is based on its ability to produce the major crops grown in the region without soil treatment but with the soil in a cleared and drained condition. The scale used is 1 to 10, the *most productive soil* in the state being rated as 1 and the *least productive* as 10.

Soil Reports Published

1 Clay, 1911
2 Moultrie, 1911
3 Hardin, 1912
4 Sangamon, 1912
5 LaSalle, 1913
6 Knox, 1913
7 McDonough, 1913
8 Bond, 1913
9 Lake, 1915
10 McLean, 1915
11 Pike, 1915
12 Winnebago, 1916
13 Kankakee, 1916
14 Tazewell, 1916
15 Edgar, 1917
16 DuPage, 1917
17 Kane, 1917
18 Champaign, 1918
19 Peoria, 1921
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46 Edwards, 1930
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48 Effingham, 1931
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53 Calhoun, 1932
54 Ford, 1933
55 Jackson, 1933
56 Schuyler, 1934
57 Clinton, 1936
58 Washington, 1937
59 Marshall, 1937

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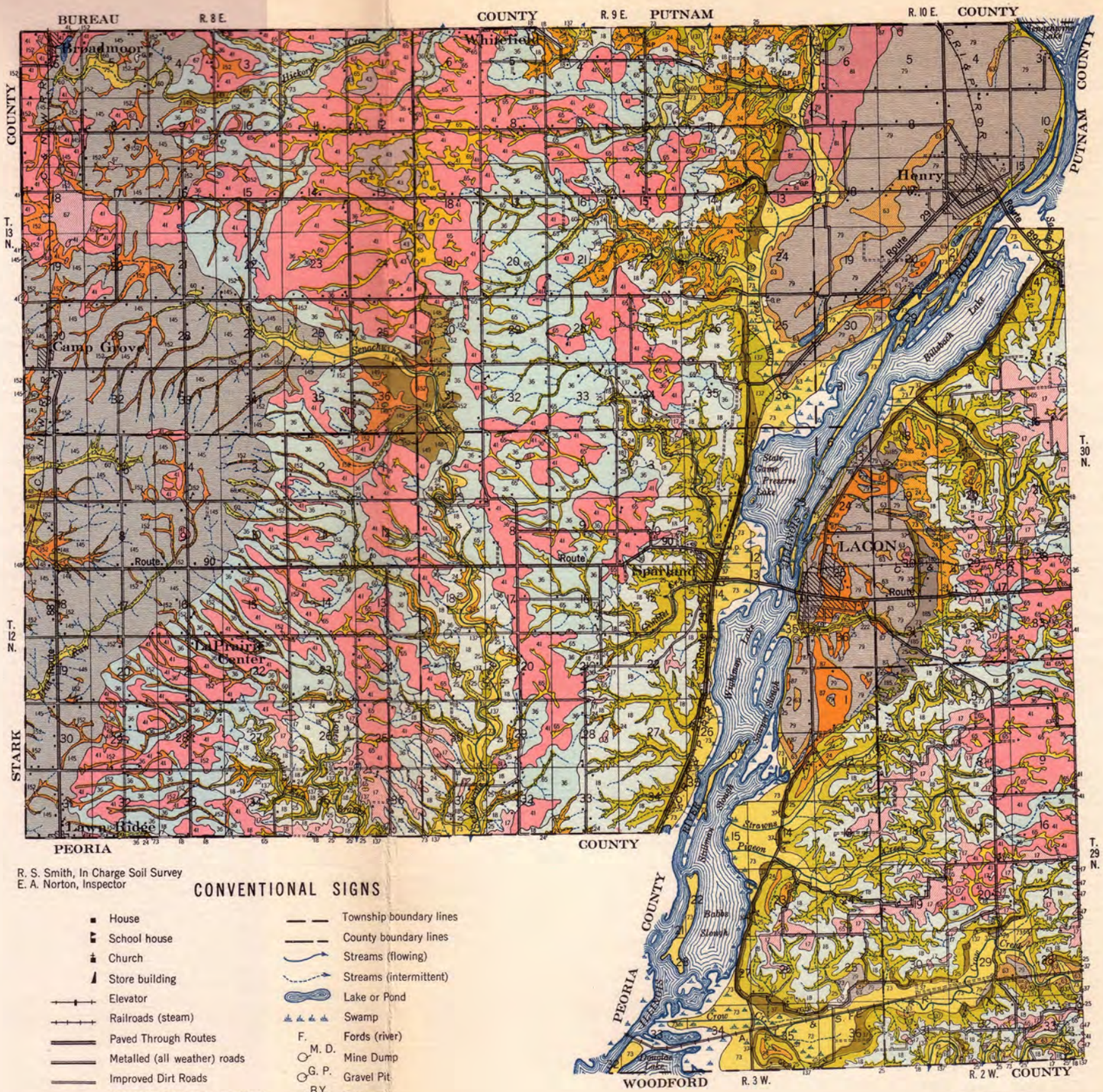
MARSHALL COUNTY
SOIL MAP

THE LOCATION of each soil type in Marshall county is indicated on this map (consisting of two sections). The positions of streams, roads, railroads, and towns also are shown in order to help one in locating a particular farm or region. A distinctive color and a number are used to identify each soil type.

For a description of each type and a statement of its best use and recommended management, see pages 11 to 26, consulting *Contents,* page 2, for precise page references.

LEGEND

17	Berwick silt loam
18	Clinton silt loam
23	Blount silt loam
24	Miami silt loam
25	Hennepin gravelly loam, eroded
36	Tama silt loam
37	Worthen fine sandy loam, bluff wash
41	Muscatine silt loam
43	Grundy silt loam
60	LaRose silt loam
63	O'Neill sandy loam, terrace
65	Grundy clay loam
67	Harpster clay loam
73	Huntsville loam, bottom
79	O'Neill silt loam, terrace
81	Littleton silt loam, terrace
87	Sumner sandy loam, terrace
137	Ellison silt loam, terrace
145	Saybrook silt loam
146	Elliott silt loam
148	Proctor silt loam
149	Brenton silt loam
152	Drummer clay loam
185	Clinton sandy loam
209	Ellison sandy loam, terrace
210	Harpster muck
222	Huntsville gravelly loam, bottom
223	Varna silt loam
	Includes small areas of Elliott silt loam



R. S. Smith, In Charge Soil Survey
E. A. Norton, Inspector

CONVENTIONAL SIGNS

- House
- School house
- Church
- Store building
- Elevator
- Railroads (steam)
- Paved Through Routes
- Metalled (all weather) roads
- Improved Dirt Roads
- Secondary Dirt and Private Roads
- Township boundary lines
- County boundary lines
- Streams (flowing)
- Streams (intermittent)
- Lake or Pond
- Swamp
- F. Fords (river)
- M. D. Mine Dump
- G. P. Gravel Pit
- B.Y. Brick yard
- Limestone outcrop

Scale
0 ¼ ½ 1 2 Miles
1934

Soils Surveyed by
Herman Wascher, in Charge
Eric Winters
J. E. Gieseking
D. C. Maxwell

SOIL SURVEY MAP OF MARSHALL COUNTY

UNIVERSITY OF ILLINOIS AGRICULTURAL EXPERIMENT STATION

Carto. Huebinger Co., Chicago
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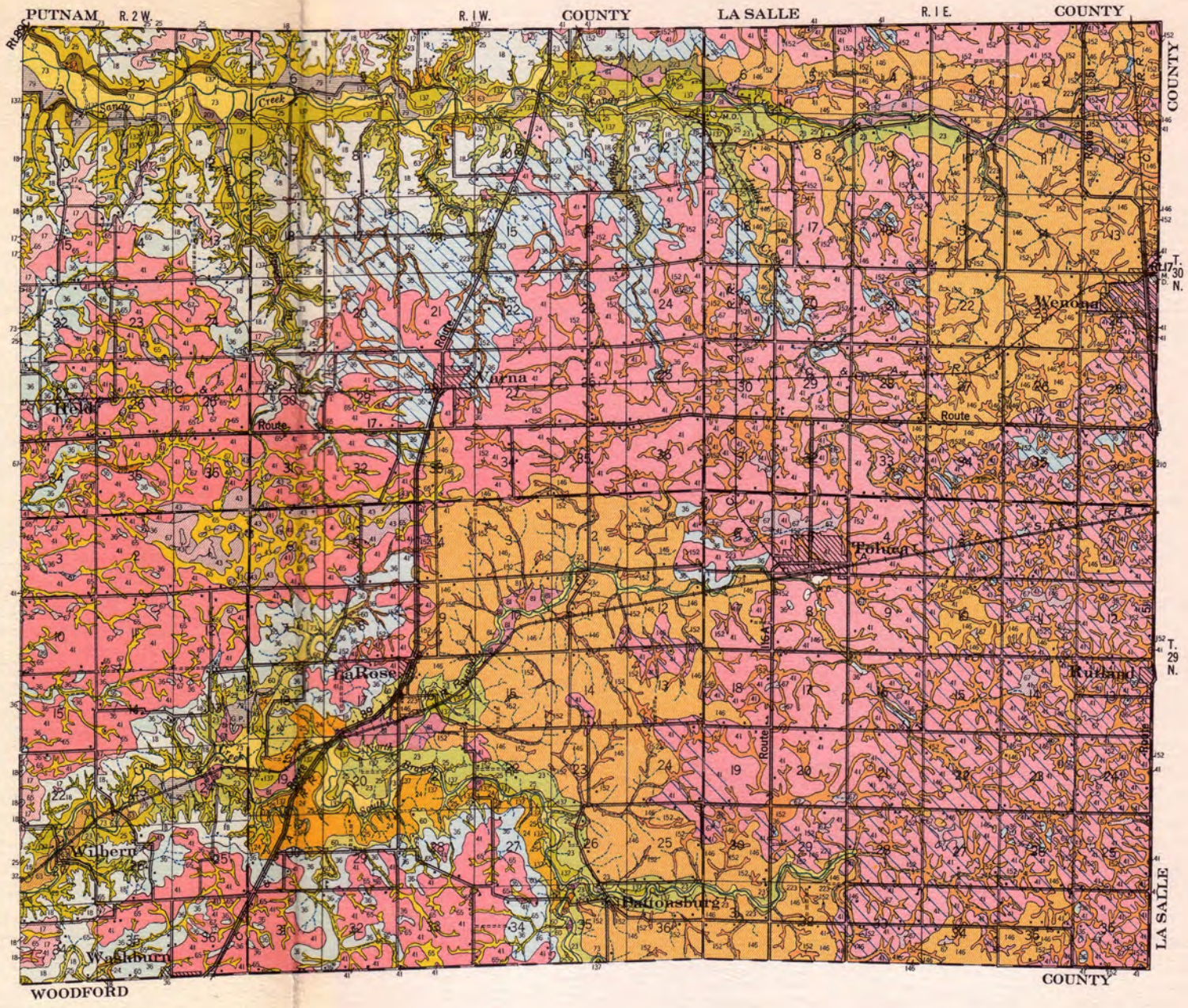

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