UNIVERSITY OF ILLINOIS

Agricultural Experiment Station

SOIL REPORT No. 60

PUTNAM COUNTY SOILS

By HERMAN WASCHER, R. S. SMITH, AND L. H. SMITH

URBANA, ILLINOIS, JULY, 1937

"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 a 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 materials in it represent 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.

CONTENTS

PAGE

GEOGRAPHICAL FEATURES 3
- Agricultural Production 4
- Temperatures and Rainfall 5
- Topography and Drainage 6

FORMATION OF PUTNAM COUNTY SOILS 7
- Origin of Soil Material 7
- How the Soil Was Developed 9

SOIL CLASSIFICATION AND MAPPING 10

SOIL TYPES OF PUTNAM COUNTY, THEIR USE, CARE, AND MANAGEMENT 11
- Berwick silt loam 11
- Clinton silt loam 12
- Blount silt loam 13
- Miami silt loam 14
- Hennepin gravelly loam, eroded 15
- Tama silt loam 15
- Worthen fine sandy loam, bluff wash 16
- Muscatine silt loam 17
- Grundy silt loam 18
- O'Neill sandy loam, terrace 19
- Grundy clay loam 19
- Harpster clay loam 20
- Huntsville loam, bottom 20
- O'Neill silt loam, terrace 21
- Littleton silt loam, terrace 21
- Sumner sandy loam, terrace 22
- Swan clay loam, bottom 22
- Ellison silt loam, terrace 23
- Saybrook silt loam 23
- Elliott silt loam 24
- Onarga sandy loam 25
- Drummer clay loam 25
- Clinton sandy loam 25
- Ellison sandy loam, terrace 26
- Huntsville gravelly loam, bottom 27
- Varna silt loam 27

SUMMARY OF CHARACTERISTICS OF PUTNAM COUNTY SOILS 28

PUTNAM COUNTY SOILS

By Herman Wascher, R. S. Smith, and L. H. Smith[1]

GEOGRAPHICAL FEATURES

PUTNAM COUNTY is located in the north-central part of Illinois at the big bend of Illinois river. It is the smallest county in the state, having an area of 171.35 square miles. Approximately one-fourth of the county lies on the west side of Illinois river and three-fourths on the east side. Hennepin is located on the east bank of the river and is the county seat. Other of the more important towns are Granville, McNabb, and Magnolia.

The county was organized in 1831, at which time the boundaries also included the territory that now makes up the counties of Bureau, Stark, and Marshall. It is said that the dwelling of the first white settler within the limits of Putnam county was erected in 1825 on the east bank of Illinois river, about two miles above Hennepin. Settlers poured in rapidly at the close of the Blackhawk War, until by 1870 there were about 6,300 inhabitants. From 1870 to 1900 there was a slight decline in population, and then another increase. The maximum of 7,600 inhabitants was reached between 1910 and 1920, after which there was a rather sharp decline. In 1930 the United States Census recorded 5,300 inhabitants (Fig. 1).

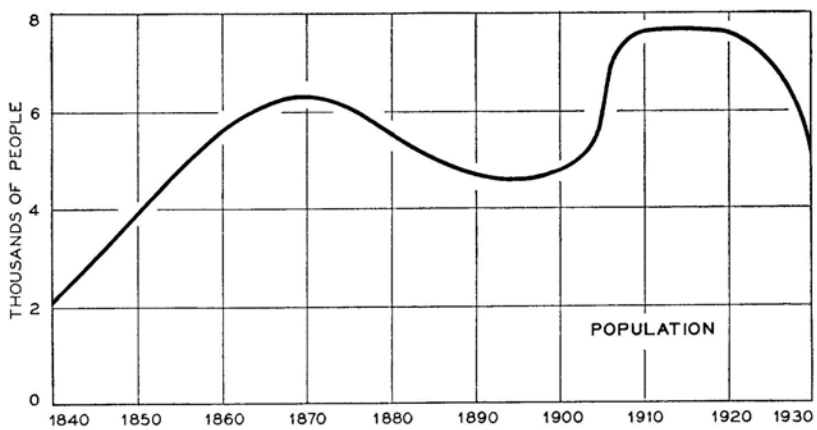


Fig. 1.—Growth of Population in Putnam County

The population of Putnam county increased steadily from about 2,000 at the time the first U. S. Census was taken, in 1840, to over 6,000 in 1870. A definite decline then took place until 1890, followed by a sharp upturn between 1900 and 1910. The increase was temporary, however, a rapid decline occurring after 1920. In 1930 only about 5,300 inhabitants were recorded.

[1]Herman Wascher, Assistant Chief in Soil Survey; R. S. Smith, Chief in Soil Physics and Soil Survey; L. H. Smith, Chief in Charge of Publications of the Soil Survey.

Transportation facilities for Putnam county are good. Besides Illinois river, the county is served by three railroad systems—the New York Central and the Chicago and Alton in the eastern part, and the Chicago, Rock Island, and Pacific on the west side of Illinois river. The hard-road system has been so planned that few points in the county are as much as five miles from a pavement. A large portion of the secondary roads have already had gravel applied to them, and others are being graveled from time to time, so that in the near future every farmstead in the county should have an outlet on an all-weather road.

Agricultural Production

Early agricultural development in Putnam county was favored by a relatively high percentage of rolling, well-drained prairie land bordering the narrow belt of timbered bluff land along Illinois river. By 1880 more than half the area of the county was in crops. Artificial drainage of the more nearly level prairie

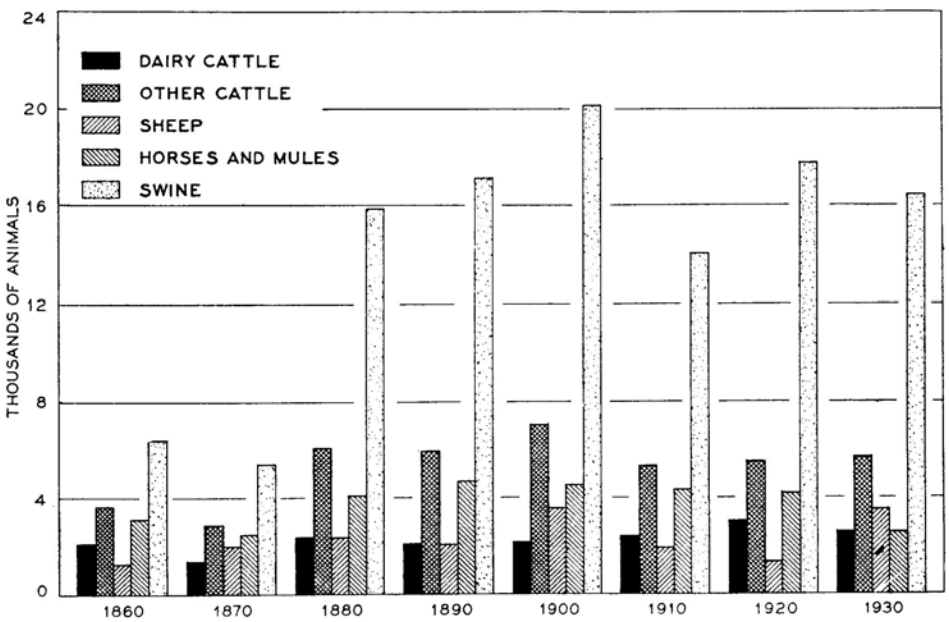


FIG. 2.—PRODUCTION OF PRINCIPAL CLASSES OF LIVESTOCK IN PUTNAM COUNTY

Hogs have always occupied a major place in the livestock of this county. During the past fifty years they have numbered around 16,000 to 20,000. Beef production during this period has been represented by about 6,000 head of cattle. The number of dairy cows has remained around 3,000. A revival of interest in sheep appears to have taken place between 1920 and 1930, the number increasing from 1,300 to 3,500 during this time. The horse and mule population has followed the general trend thruout the country in declining in these later years with the increased use of mechanical power.

land and the construction of a levee along Illinois river south of Hennepin brought all the tillable land into production. At the present time 89 percent of the county is being farmed. The untillable portions are made up of lakes, swampy bottom, and steep bluff land.

The principal crops grown in the county are those common to the corn belt. From the first, corn has been the most important crop grown in the county, exceeding the combined acreages of all other grain crops except during the period of high wheat production brought on by the World War. The acreage of hay has remained relatively constant thruout the entire period. Table 1 shows the average acreages and the average acre-yields of corn, oats, wheat, and hay for the ten-year period 1925-1934. The state acre-yield is included for comparison.

Other field crops of some importance are barley, alfalfa, sweet clover, and soybeans. Fruit and vegetable crops are of little commercial importance.

TABLE 1.—AVERAGE ANNUAL ACREAGES AND YIELDS OF CORN, OATS, WHEAT, AND HAY IN PUTNAM COUNTY, ILLINOIS, AND IN THE ENTIRE STATE, 1925-1934

	Area in Putnam county	Yield per acre	
		Putnam county	State
	acres		
Corn	27 100	40.0 bu.	33.4 bu.
Oats	12 800	37.1 bu.	29.2 bu.
Wheat	5 000	20.3 bu.	16.6 bu.
Tame hay	6 900	1.33 tons	1.25 tons

The number of tenant farmers increased rapidly after about 1890. For the last twenty-five years more than 50 percent of the farms have been operated by tenants. Despite this fact livestock production has continued to be an important part of the agriculture of the county (Fig. 2). Hog production predominates. Since about 1880, except in 1910, the number of hogs has exceeded the combined number of all other farm animals. Beef-cattle production has declined slightly since 1900, and the number of horses has declined markedly since 1920. Sheep and dairy cattle have remained fairly constant thruout the entire period shown by the graph. Poultry production reached its high point in 1920, since which time it has declined. The 1935 Census of Agriculture shows a still further decline in the number of horses, hogs, and sheep, and in dairy and other cattle combined. Since the number of dairy cattle has increased, this means that the number of cattle other than dairy cows has markedly declined.

Temperatures and Rainfall

The humid, temperate climate of Putnam county is characterized by a wide range in temperature between the extremes of winter and summer, and a somewhat irregularly distributed rainfall. The mean summer temperature for the seventeen-year period 1920 to 1936, taken from the Weather Bureau Station at Galva, was 73.2° F. and that of winter was 28.0° F. The highest temperature recorded during this period was 111° F. on July 4, 1936, and the lowest was 26° F. below zero on December 28, 1924.

The average date of the last killing frost in spring during the seventeen-year period was May 5; the earliest in the fall, October 14; giving an average growing season of 164 days. The shortest growing season recorded was 120 days in 1928, and the longest, 194 days in 1924.

The average annual rainfall recorded at the Tiskilwa Weather Bureau Station during this same seventeen-year period was 34.63 inches. The yearly rainfall varied from a minimum of 26.02 inches in 1922 to a maximum of 45.01 inches in 1921. For five years during this period the annual rainfall was less than 30 inches, and during two additional years it exceeded this amount by less than an inch.

The distribution of rainfall during the growing season is an important factor in crop production. It is, however, of less importance in Putnam county than in some other regions of the state where the soils do not have a good absorptive and retentive capacity.

It is impossible to make any general statement as to the harmfulness of a rainless period of any given length. The character of the rainfall preceding the rainless period; the character of the soil, the kind of crop and its stage of development, the relative humidity, the sunshine, the temperature, and the wind velocity, all have important bearing on the degree of injury that a rainless period of a given length will cause.

With these complex relationships in mind it is of interest to note the rather numerous dry periods that have occurred during the growing season within the past seventeen years. If a lapse of 30 days in which no rain falls within 24 hours to exceed a half inch be taken as a drouth period, then there are fifteen such drouth periods on record during these seventeen years. Eight of these years had a rainless period lasting 40 days or longer, and in one year two such periods occurred. The longest rainless period of this nature was 96 days, occurring in 1936.

Topography and Drainage

Putnam county is in a region of considerable relief. Most of the bottomland along Illinois river lies about 445 feet above sea level. The terrace formations, upon which the towns of Putnam and Hennepin lie, average an altitude of approximately 525 feet, while the uplands range from 650 to 770 feet above sea level, the highest part of the county being in the region of Granville.

Tho the maximum relief is approximately 325 feet, headwater erosion or gullying has not cut any great distance into the uplands, as it has done where the geological formation is older and the streams have had longer time to act. Even where no terrace formation intervenes between the upland and the bottomland, the gullies have seldom cut more than a mile or two back from the important streams.

The county is relatively well-drained on the whole, tho a considerable area in the eastern part required artificial drainage, mostly in the form of tile, before it could be considered entirely desirable for farming purposes. After being drained, however, it makes the most fertile cropland. The bottomlands are low-lying, for the most part, and consequently subject to rather frequent overflow unless protected by levees. The terraces, on the other hand, are mostly too well drained; that is, the underlying incoherent sand and gravel are so near the surface that downward percolation of rainfall is very rapid, tending to cause drouthiness, especially for crops such as corn, that require a high amount of moisture for growth during the season of low rainfall.

FORMATION OF PUTNAM COUNTY SOILS

Origin of Soil Material

The materials from which the upland soils of Putnam county were developed were deposited during the Glacial epoch. Two glaciers are known to have covered the region of this county—the Illinoian and the Wisconsin. Only glacial till from the latter, however, together with such wind-blown material or loess as was deposited after the retreat of the Wisconsin glacier, are important as parent materials. The terraces along the streams tributary to Illinois river were formed at the time of the retreat of the Early Wisconsin glacier. Those

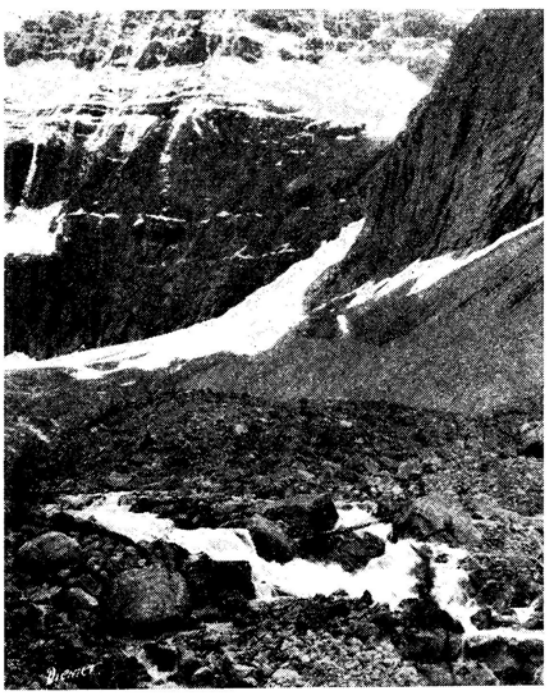


FIG. 3.—A PRESENT-DAY GLACIER

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.

along the Illinois river itself were probably partially formed at that time and then more completely developed during the period of high water that followed the retreat of the late Wisconsin glacier. The parent material of the bottomland soils is alluvium and of geologically recent origin, having been deposited by the streams when in flood and heavily loaded with sediment.

At intervals during the geological age known as the Pleistocene, the climate in certain of the northern regions became such that the covering of snow and ice did not melt completely during the summer seasons. As these snow and ice

blankets thickened from year to year, they finally became so deep as to produce a pressure great enough to cause outward movement. These moving ice sheets are known as glaciers.

One of the ice sheets which entered Illinois is known as the Wisconsin glacier. This ice sheet, originating in the region of Labrador, covered the region of Putnam county. From this center of origin advancement was chiefly southward and southwestward and was aided by accumulations at the margin. In moving across the country the ice gathered up all sorts of material, including the till of former glaciers as well as masses of the underlying bed rocks. As it was carried along, this heterogeneous material became thoroly mixed. The pebbles and stones and even boulders were crushed and ground by being rubbed against each other and against the underlying bed rock.

About the time this glacier reached a front just to the west of Putnam county, a slight reversal in the climate brought temperatures high enough to melt the ice as fast as the glacier advanced and eventually to melt it more rapidly than it advanced. During this retreat the glacier let drop the mixed silty, sandy, pebbly material which it carried and which we know as Early Wisconsin glacial till. This till is highly calcareous, pebbly, and permeable. It is a desirable parent soil material.

Immediately following this first substage of the Wisconsin glacier came another advance known as the Middle Wisconsin substage, which did not go beyond Illinois river and covered only a portion of the territory on the east side of the county. The till material from this glacier, exposures of which are shown on the soil map on the eroding hillsides of the bluff land, is highly calcareous, clayey, and somewhat impermeable. It is not very desirable as a parent soil material. These two till materials will be discussed further under the individual soil-type descriptions.

The huge volume of water released by the melting of these two glaciers, together with that of a following glacier, the Late Wisconsin, carried vast quantities of silt, sand, and gravel into the Illinois river valley. The coarser sand and gravel was deposited in the upper reaches of the river valley during times of high and very rapid water, the finer silt and clay being carried farther down stream, much of it into the Gulf of Mexico. As the waters receded, however, at the end of each melting season or during the final period of recession, when a smaller volume of water was flowing, much of the fine-grained material was deposited in the upper portions of the valley over the coarse sand and gravel. Much of this fine silty material was picked up by the wind, because it was not stabilized by vegetation, and moved on to the upland. Here its movement was retarded or stopped by vegetation, and deposits accumulated that varied from 10 to 15 feet in thickness near the bluff to about 6 or 7 feet at the outer boundaries of the county. This wind-blown material, known as loess, being of a uniform silty texture and high in the plant-food elements, was an excellent material for soil development, and from it a majority of the present soils were formed. The existing slopes following the retreat of the glacier were subjected to varying degrees of erosion, so that the loessial material was built into thick deposits only on the more nearly level-lying land, the steeper portions being kept washed relatively bare, tho the coming in of vegetation tended to

slow down this process. It is for this reason that much of the more sloping bluff soils are shown on the soil map as derived from glacial till rather than from loess soils.

How the Soil Was Developed

As soon as the glacial till and loess material was deposited it became subject to the agencies of weathering, of which rainfall and temperature are two of the most important. If a soil survey had been made at that time, probably

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."

the only basis for a separation of the soils would have been texture; that is, the sands would have been distinguished from the silts, and so on. However, as weathering progressed and was influenced by numerous factors such as topography and native vegetation, other differences began to appear; the material began to take on characteristics which varied from place to place. The high water table under the nearly level or depressional areas resulted, for example, in a luxuriant growth of slough grass. The same set of conditions which favored a luxuriant grass growth also slowed up its decomposition, and organic matter therefore accumulated, causing the surface soil to become dark brown or black. The character of the deeper portions of such a soil profile is also influenced by the high water table, as indicated by a gray or drab-colored subsoil.

In direct contrast to a black surface horizon and a drabbish subsoil on the nearly level or depressional areas is a light-brown surface and a yellow or reddish-yellow subsoil on the slopes. The better drainage provided by a relatively deeper water table results in less accumulation of organic matter and in brighter colors thruout the profile. Other examples might be given of the way

in which environment influences soil character and causes many different kinds of soil to develop from what were originally relatively uniform soil materials.

SOIL CLASSIFICATION AND MAPPING

The "soil type" is the unit of classification in the soil survey. As pointed out in the preceding paragraphs, each soil type has developed a definite set of characteristics upon which its separation from other types is based. Failure to appreciate the fact that soil types are differentiated on the basis of the character and arrangement of the entire profile, and not on the surface few inches alone, often makes it difficult to understand what is meant by a "soil type." It is of utmost importance, therefore, in studying descriptions of soil types to note carefully the outstanding features of the entire profile. Each type thruout the area

TABLE 2.—PUTNAM COUNTY SOILS: AREAS OF THE DIFFERENT SOIL TYPES

Type No.	Type name	Area in square miles	Area in acres	Percent of total area
17	Berwick silt loam	1.91	1 222.4	1.11
18	Clinton silt loam	19.18	12 275.2	11.19
23	Blount silt loam	3.20	2 048.0	1.87
24	Miami silt loam	3.25	2 080.0	1.90
25	Hennepin gravelly loam, eroded	11.99	7 676.6	7.00
36	Tama silt loam	29.39	18 809.6	17.15
37	Worthen fine sandy loam, bluff wash	.98	627.2	.57
41	Muscatine silt loam	29.22	18 700.8	17.05
43	Grundy silt loam	.08	51.2	.05
63	O'Neill sandy loam, terrace	.58	371.2	.34
65	Grundy clay loam	11.61	7 430.4	6.77
67	Harpster clay loam	.21	134.4	.12
73	Huntsville loam, bottom	10.68	6 835.2	6.23
79	O'Neill silt loam, terrace	9.82	6 284.8	5.73
81	Littleton silt loam, terrace	.71	454.4	.42
87	Sumner sandy loam, terrace	5.35	3 424.0	3.12
107	Swan clay loam, bottom	6.06	3 878.4	3.54
137	Ellison silt loam, terrace	1.34	857.6	.79
145	Saybrook silt loam	.19	121.6	.11
146	Elliott silt loam	.21	134.4	.12
150	Onarga sandy loam	1.37	876.8	.80
152	Drummer clay loam	.10	64.0	.06
185	Clinton sandy loam	3.91	2 502.4	2.28
209	Ellison sandy loam, terrace	1.31	838.4	.76
222	Huntsville gravelly loam, bottom	1.45	928.0	.85
223	Varna silt loam	.32	204.8	.19
	Swamp	3.44	2 201.6	2.01
	Lake	10.74	6 873.6	6.27
	Illinois river	2.49	1 593.6	1.45
	Gravel pit	.16	102.4	.09
	Mine dumps	.10	64.0	.06
	Totals	171.35	109 664.0	100.00

of its occurrence has the same characteristics and the same potential producing capacity, altho it may vary even on a single farm in its present productivity because of differences in treatment and management.

A list of the soil types occurring in Putnam county is given in Table 2, which shows also the area of each type and the percentage that each constitutes

of the total area of the county. The accompanying soil map shows the location and boundary of each soil type, the position of roads, streams, railroads, towns, farm dwellings, schoolhouses, and various other identifying features.[1]

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

A brief description of the outstanding characteristics of each soil type mapped in Putnam county, together with general recommendations on its use, care, and management, is given on the following pages. Under the management recommendations frequent reference is made to the following publications of this Experiment Station:

Circular 290—"Saving Soil by Use of Mangum Terraces"
Circular 346—"Test Your Soil for Acidity"
Circular 421—"Testing Soil for Available Phosphorus"

A thoro study of these publications and of Bulletin 405, "Response of Illinois Soils to Limestone," and Bulletin 362, "Response of Illinois Soils to Systems of Soil Treatment," will prove helpful in planning a sound soil-improvement program. These and other publications may be obtained free of charge by addressing the Agricultural Experiment Station, University of Illinois, Urbana, Illinois.

Berwick silt loam (17)

Berwick silt loam is a light-colored loess-derived soil that has developed on nearly level topography under deciduous forest vegetation. It occurs east of the river in the northern and southern parts of Putnam county as small areas surrounded by Clinton silt loam. It occupies a total area of less than two square miles.

The surface is a yellowish-gray silt loam 6 to 8 inches thick, low in organic matter and nitrogen and medium acid in reaction. In an uncultivated forested area the upper 2 to 3 inches of this horizon is brownish gray. A scattering of brownish-black iron pellets over the surface and thruout the soil profile is common in this type. The subsurface is a yellowish-gray very friable silt loam 7 to 9 inches thick. The subsoil is yellowish-gray medium-plastic clay loam, 12 to 16 inches thick which when dry breaks into ¼- to ¾-inch subangular aggregates. Below 28 to 32 inches the material is a friable silt that usually becomes calcareous at 50 to 60 inches.

Use and Management.—The surface drainage of this soil is slow to moderate because of the nearly level to very gently sloping topography. Underdrainage is also somewhat slow owing to the moderately developed claypan subsoil. Tile will draw in this soil, tho the laterals should be placed closer together than is necessary in a more open soil. Erosion is negligible.

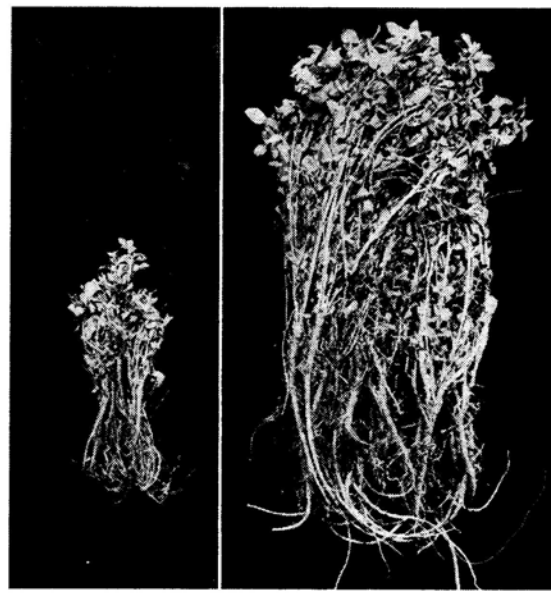
When untreated, this soil does not produce satisfactory grain crops. It

[1]Data secured from the Illinois State Geological Survey and from the U. S. Geological Survey topographic maps were used in locating boundaries and angles of township lines and section lines; also boundaries of the various lakes and swamps and of Illinois river.

should be kept in timber so far as possible. However, if already cleared, it can be built up to produce satisfactory yields by the use of limestone and the growing of legumes or the application of manure. Before attempting to grow legumes, however, acidity tests should be made, as explained in Circular 346, and limestone applied in the amounts recommended. If this soil is to be used for permanent bluegrass pasture, an application of limestone, as indicated by the same test, is recommended.

Clinton silt loam (18)

Clinton silt loam is one of the more extensive soil types in Putnam county, occupying a total area of about 19 square miles. It is a light-colored loess-derived soil that has developed on undulating to gently rolling topography on slopes of approximately 2 to 6 percent under a deciduous forest vegetation. It occurs



No limestone Limestone

FIG. 5.—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.

as an irregular, disconnected belt along the bluff of Illinois river and along the larger stream tributaries in association with Berwick, Miami, and Blount silt loams.

The surface is 4 to 7 inches thick and is a grayish-yellow silt loam low in organic matter and nitrogen and medium acid in reaction. In undisturbed forested areas the upper 2 or 3 inches of this horizon is brownish gray. The subsurface is 4 to 7 inches thick and is a grayish-yellow friable silt loam. The subsoil is 12 to 16 inches thick and is grayish-yellow, medium-plastic, silty clay loam which when

dry tends to break into ¼- to ¾-inch subangular, faintly drabbish-coated aggregates. Below 26 to 30 inches the material is a friable silt that usually becomes calcareous at 50 to 60 inches.

Use and Management.—The 2- to 6-percent slopes upon which this soil occurs furnish, for the most part, moderate surface drainage, tho in places drainage becomes moderately rapid. Underdrainage is also moderate, thus furnishing a very favorable combination of drainage characteristics. Erosion, however, is harmful following cultivation, particularly on the 5- to 6-percent slopes, but it can be successfully controlled by strip cropping and contour farming. This soil also lends itself to terracing, as the underlying loess material is deep.

Clinton silt loam has a low productive level when farmed without treatment but it has the capacity to respond to limestone, legumes, and manure. Before attempting to grow sweet clover or alfalfa, a test for acidity, as explained in Circular 346, should be made and limestone applied at the rates indicated. Alfalfa responds well to phosphate, and it is suggested that if this crop is seeded, either superphosphate or rock phosphate be applied (see Circular 421). Much of this land is used for permanent bluegrass pasture. The carrying capacity of these pastures can be increased by an application of limestone. It is not considered good practice to fall-plow this soil, as special effort should be made to have some vegetative cover on the slopes during the fall, winter, and early spring.

Blount silt loam (23)

Blount silt loam is a minor type occupying about 3 square miles in Putnam county. It is a light-colored soil derived from thin loess on compact, calcareous, glacial till and has developed on rolling topography under a deciduous forest cover. The most extensive areas are found in the hilly region just to the north and west of Mark; other small scattered areas are found along the rough bluff land to the south. All of this type lies on the east side of Illinois river.

The surface, which is 3 to 7 inches thick, is a grayish-yellow silt loam low in organic matter and nitrogen and medium acid in reaction. In undisturbed forest areas this horizon is 6 to 7 inches thick, the upper part being brownish gray and the lower part gray. The subsurface is grayish yellow. Sometimes it is completely absent but it may be 6 to 8 inches thick, depending on the severity of erosion. The subsoil, which is 12 to 16 inches thick, is a brownish-yellow, compact, medium-plastic clay loam which when dry breaks into distinct ¼- to ¾-inch subangular to angular drabbish-coated aggregates. Below 25 to 30 inches the material is usually a compact calcareous glacial till. In Putnam county, however, a loess remnant several inches thick often occurs below the subsoil, so that the till may lie 40 or even 45 inches beneath the surface, altho even at this depth it still exerts some influence on the features characteristic of this soil type.

Use and Management.—Blount silt loam occurs in Putnam county on slopes varying from 4 to 10 percent and occasionally even 12 percent. Surface drainage is therefore rapid. Underdrainage, however, is moderately slow to slow, depending on the depth to the underlying slowly permeable glacial till.

The control of erosion on this soil is a difficult problem because of the steep

slopes on which it occurs and because it does not absorb water freely. This combination of conditions results in high and rapid runoff and consequently in severe erosion. Experience indicates that on this soil vegetative protection must be depended on to a large extent to reduce erosion, tho on areas having the deeper loess cover mentioned above terracing may be used to advantage to supplement vegetative control. The difficulties of controlling erosion on this relatively low-value soil suggest that the steeper slopes should be kept in pasture. Where the slope exceeds 10 percent the best use is probably for timber. The more moderate slopes may be successfully cropped, but constant vigilance must be exercised and intelligent farming practices used to avoid rapid and permanent deterioration. Blount silt loam should not be fall-plowed.

Miami silt loam (24)

Miami silt loam occupies about 3 square miles in Putnam county. It occurs in association with Hennepin gravelly loam and Clinton silt loam. The most extensive areas occur on the west side of Illinois river to the south and southwest of Putnam. It is a light-colored soil derived from a thin loess cover on friable calcareous till under a deciduous forest vegetation and occurs on rolling topography.

The surface is 4 to 7 inches thick and is a grayish-yellow silt loam low in organic matter and nitrogen and medium acid in reaction. In undisturbed forested areas this horizon is 6 to 7 inches thick, yellowish gray in the lower part and brownish gray in the upper 2 or 3 inches. The subsurface is 3 to 7 or 8 inches thick and is a grayish-yellow to yellow friable silt loam. The thickness of the surface and subsurface horizons depends considerably upon the amount of erosion that has taken place since the clearing of the forest cover. The subsoil is 12 to 16 inches thick and is a grayish-yellow, medium-plastic, silty clay loam which when dry tends to break into ¼- to ¾-inch subangular aggregates. Below 25 to 30 inches the material is ordinarily a friable, pebbly, calcareous glacial till. In this county, however, a remnant of loess several inches thick sometimes occurs beneath the subsoil, so that the till may lie 40 or 45 inches below the surface.

Use and Management.—Since the slopes on which this type occurs in Putnam county vary from 4 to 12 percent, or even to as much as 15 percent in a few areas, the uses to which this soil should be put and the farming practices employed must also vary. Surface drainage is rapid, for the most part, and cultivated fields commonly show a serious loss of soil material. Underdrainage is moderate, and this is always a favorable condition in a soil.

Tho loss of soil material by erosion always means soil deterioration, the results of erosion are not so serious on Miami silt loam as on the preceding type, Blount silt loam, for on Miami the underlying gravelly glacial till, being more permeable to water and to roots, might support vegetation, whereas Blount is underlain by a more compact stratum which offers a less favorable medium for plant growth. The methods adopted to reduce erosion will vary with the type of farming followed and the slope and depth to the underlying gravel. Contour tillage should be practiced on cultivated fields, and fall plowing should always

be avoided. In places strip cropping will quickly demonstrate its value. Terracing is advisable on the less-steep slopes, when accompanied by a soil treatment that will produce a vigorous growth of vegetation. The steeper slopes should be used for permanent pasture or meadow. Such use will control erosion if a good growth of grass is secured.

While the erosion-control measures to be adopted on this soil type will vary, as indicated above, basic to any erosion-control program is an understanding of the soil conditions, chemical as well as physical, on the individual field concerned. This means that the soil should be tested for acidity and available phosphorus as described in Circulars 346 and 421, and a sufficient number of borings made to determine the depth to glacial till.

Hennepin gravelly loam, eroded (25)

Hennepin gravelly loam, eroded, occurs on the steep bluff land along Illinois river and also on the rough and broken gullied land along the tributary streams. It occupies a total of about 12 square miles. The slopes where this soil is mapped are variable, being at least 15 percent but usually ranging between 25 and 50 percent. Destructive erosion always follows the removal of the natural forest cover, so that a part or all of the soil horizons may be absent. However, in an uncleared virgin area there is usually a 3- to 5-inch brownish-yellow surface, a 2- to 4-inch yellow subsurface, and a 6- to 12-inch reddish-yellow pebbly subsoil. In badly eroded areas such as freshly cut gullies the highly calcareous gravelly till is usually exposed.

Use and Management.—Areas of Hennepin gravelly loam which have been cleared have been seriously injured by erosion. On such areas the subsoil, and even the material beneath the subsoil, is frequently exposed, and the problem is to get some kind of protective vegetative growth started. Sweet clover will grow, but there is considerable hazard in getting it started. Following sweet clover, bluegrass will come in. Probably the best course to follow is to get all of this soil back into timber. Sometimes a diversion terrace may be used to advantage along the brow of the steep slope to prevent the further cutting back into the upland of the gullies already formed. The construction of temporary check dams is sometimes advisable, but any structures installed must be correctly designed and constructed or they may do more harm than good.

Tama silt loam (36)

Tama silt loam is the most extensive soil type in Putnam county, occupying an area of about 29 square miles, or a little over 17 percent of the area of the county. It is a dark-colored loess-derived soil that has developed under grass vegetation on rolling topography on slopes of 3.5 to 10 percent and in extreme cases 12 percent. It occurs as a nearly continuous belt bordering the light-colored soils and extends out along the small drainage lines into the Muscatine silt loam region. It also occupies all of the well-drained knolls and ridges that are surrounded by Muscatine silt loam.

The surface, which is 5 to 7 inches thick, is a brown to light-brown silt loam

medium in organic matter and nitrogen and medium acid in reaction. In undisturbed areas, and on the lesser slopes particularly, this horizon may be rather dark and fairly high in organic matter, but where farmed, and more particularly on the more sloping areas, it is light brown or even somewhat reddish brown, depending on the amount of erosion that has already taken place. The subsurface is 4 to 7 inches thick and is a brownish-yellow silt loam. The subsoil is 10 to 16 inches thick and is a brownish-yellow to reddish-yellow slightly plastic silty clay loam which when dry tends to break into irregular ¼- to ½-inch subangular aggregates. Below 25 to 28 inches the material is a yellowish friable silt with some gray mottling that is ordinarily calcareous at a depth of 50 to 60 inches.

Use and Management.—Surface drainage is rapid on the steeper slopes occupied by this soil, and as a result serious erosion occurs on cultivated fields unless effective erosion-control measures are practiced. This soil absorbs water readily and underdrainage is good; nevertheless there is sufficient runoff to be harmful on unprotected slopes. The control of erosion is relatively easy on this soil, as it is well adapted to terracing, and vegetation can be so managed as to effectively control erosion since it is easy to get a vigorous growth.

While Tama silt loam is not a corn soil in the sense that some of the heavier soils are, yet if it is well farmed with a short rotation including legumes, very good corn crops are produced. Limestone should be applied as indicated by the acidity test, and the need for phosphate should be studied with the phosphate test.

Worthen fine sandy loam, bluff wash (37)

Worthen fine sandy loam, bluff wash, is a minor type in Putnam county, occupying an area of less than one square mile. It occurs as a narrow strip along the base of the Illinois river bluff in the northern part of the county and as small alluvial fans elsewhere. It is variable in color, texture, and depth of horizons, these features being dependent on the present rate of soil deposition and the kind of material recently deposited; consequently no definite horizon separations can be made. Under ordinary conditions the wash from deep-loess country is a silt or a very fine sand; this makes desirable material for the development of a soil. However, the recent clearing of the bluff of its protective cover of brush and trees has caused many short sharp gullies to form which are now cutting into the gravelly glacial till that underlies the silty loess. This undesirable wash is being deposited at the mouths of many of these gullies, in the form of small gravel fans, on top of the finer and more desirable material. Tho the combined area of the gravelly fans is very small, yet to an individual landowner, they may be important. These undesirable gravelly deposits will continue to grow worse unless measures are immediately undertaken to control the gullies, which are the source of the gravel.

Use and Management.—Further deposition of coarse sediments on this soil can be prevented only by controlling gullies in the adjacent bluffs (see discussion under Hennepin gravelly loam, page 15). After further sand and gravel deposition has been completely prevented, the gravelly fans can then be seeded to some

deep-rooted crop such as sweet clover or alfalfa. The better portions of this soil are productive and need only good farming to bring satisfactory crop returns.

Muscatine silt loam (41)

Muscatine silt loam occupies practically the same area in Putnam county as Tama silt loam or about 29 square miles. It is a dark-colored loess-derived soil that has developed on undulating to gently rolling topography under a fairly heavy prairie-grass vegetation. The slopes on which it occurs vary from about .5 to 3.5 percent. It occurs most extensively in the eastern part of the county as an almost unbroken plain from Granville to below McNabb.

The surface soil is 7 to 9 inches thick and is a brown to dark-brown silt loam medium high in organic matter and nitrogen and medium to slightly acid

No limestone Limestone

FIG. 6.—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 an acre, produced at the rate of 3.84 tons.

in reaction. The subsurface, which is 7 to 9 inches thick, is a yellowish-brown silt loam. The subsoil is 10 to 16 inches thick and is a yellowish-brown to yellowish-drab, medium-plastic, silty clay which when dry breaks into irregular ¼- to ¾-inch subangular aggregates slightly drabbish coated. Below 28 to 30 inches the material is a grayish-yellow, mottled, friable silt that ordinarily becomes calcareous at 45 to 50 inches.

Use and Management.—Natural surface drainage is good, and erosion is harmful only on the maximum slopes and then usually only under poor farming practices. If some cover crop or stubble is allowed to remain on this land during the winter, little erosion need ever occur. Fall plowing should be avoided

except on the more nearly level-lying portions of the type. Underdrainage is also good, tho tiling is advisable, particularly on the areas of lesser slope.

Muscatine is a productive soil and needs only good farming and proper treatment to produce good crops. Red clover makes a fairly good growth in favorable seasons without treatment, but for best results some limestone is needed. Limestone is required if alfalfa or sweet clover is to be grown. Testing for available phosphorus is also recommended, as a low amount of this important ele-

FIG. 7.—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.

ment often means the production of an indifferent crop. Manure or other fresh organic matter should be supplied regularly.

Results from the Kewanee experiment field may be taken as a guide in the treatment of this soil.

Grundy silt loam (43)

Grundy silt loam is a dark-colored loess-derived soil that has developed on nearly level to gently undulating topography under a heavy prairie-grass or combination prairie-grass and slough-grass vegetation.

Only 5 or 6 very small areas are shown on the map of Putnam county. However, the soil is of greater importance than the map indicates, as it occurs as narrow transition belts between Muscatine silt loam and Grundy clay loam. These transition belts are, for the most part, too small and narrow to be shown on a map of this scale, yet they are of considerable importance in the eastern part of the county.

The surface horizon is 8 to 10 inches thick and is a dark-brown silt to clayey silt loam high in organic matter and nitrogen and neutral to only slightly acid in reaction. The subsurface, which is 7 to 9 inches thick, is a dark-drabbish-brown clayey silt loam. The subsoil is 12 to 16 inches thick and is a brownish-

drab medium-plastic clay loam which breaks into ¼- to ¾-inch drabbish-coated subangular aggregates.

Use and Management.—Erosion is negligible on this soil. Underdrainage is moderate, and tile draw satisfactorily if an outlet with sufficient fall can be secured. This soil is highly productive and, after good drainage has been provided, is adapted to both the grain and the legume crops common to the region. Limestone is rarely needed to secure a good growth of alfalfa or sweet clover, but acidity tests should be made in each field before either of these crops is seeded. Manure or other fresh organic matter should be supplied at regular intervals in order to maintain good tilth.

O'Neill sandy loam, terrace (63)

O'Neill sandy loam, terrace, is a minor type in Putnam county, occupying only a little over half a square mile. It is an eroding type, having developed on rolling topography under scanty prairie vegetation. A few small areas are found along the terrace borders on the east side of Illinois river, but the largest area is found west of the river just east and southeast of the town of Putnam.

In uneroded areas the surface is 5 to 6 inches thick and varies from a light-brown sandy loam to a coarse sandy-silt loam. It is rather low in organic matter and nitrogen and acid in reaction. The subsurface is a brownish-yellow sandy loam, and the subsoil is a reddish-yellow, medium-plastic, gravelly clay loam. Below 25 to 30 inches the material is loose, incoherent, coarse sand or gravel. Since for the most part this is an eroding type in this county, much of the surface and subsurface, and in places even the subsoil, have been partly eroded away, bringing the underlying sand and gravel much nearer to the surface.

Use and Management.—Surface drainage is rapid to excessive, and erosion is a very serious problem. Underdrainage is also rapid to excessive, so that for the most part this type is drouthy. Following treatment, sweet clover and possibly alfalfa may be made to grow to some extent on the better portions of the type, but since permanent improvement is practically impossible, the wisdom of applying soil treatment is questionable. The underlying material is often used as a source of commercial sand and gravel.

Grundy clay loam (65)

Grundy clay loam occupies about 12 square miles, or nearly 7 percent of the total area of Putnam county. It is a very dark colored loess- and wash-derived soil that has developed on nearly level topography or in depressional swampy areas under heavy sedge- and slough-grass vegetation. Most of the type is found in the eastern part of the county surrounded by Muscatine silt loam or Tama silt loam.

In this soil the surface, subsurface, and subsoil are not distinctly developed, the horizons grading from one into the other instead of being sharply defined. The surface, tho its lower boundary is indistinct, is 8 to 10 inches thick and is a black clay loam high in organic matter and nitrogen and neutral in reaction. The subsurface is a black clay loam with a drab cast. It grades at 16 to 18 inches into a

dark-gray or drab, yellow-spotted, medium-plastic, clay loam subsoil that tends to break into ½- to 1-inch dark-coated subangular aggregates. Below 30 to 32 inches the material is a mixed gray and yellow friable silt that usually is calcareous at 40 to 50 inches.

Use and Management.—Surface drainage is slow and, because of the topographic position of this type, there is tendency for it to pond unless artificial drainage is provided. Wherever the bordering silt loam is rather sloping there may be some silty deposition around the edges of this type unless care has been taken to prevent sheet erosion. This condition exists where the type is surrounded by Tama silt loam. Underdrainage is moderate, and tile draw satisfactorily if an outlet with sufficient fall can be secured.

When well drained, this is a natural corn soil. Small grains tend to grow rank and may lodge at about heading time. No limestone is needed to secure a good growth of sweet clover. Alfalfa is subject to winterkilling, as water often stands on this soil in the winter when tile cannot function.

Grundy clay loam is a productive soil and needs only additions of fresh organic matter in the form of legumes or manure to maintain good tilth, and a high producing capacity. Results from the Minonk experiment field may be taken as a guide in the treatment of this soil.

Harpster clay loam (67)

Harpster clay loam is a minor type in Putnam county, occupying only .21 square mile, and this small area occurs in the northeast portion of the county. It is a dark-colored loess- and wash-derived soil found in association with Grundy clay loam, usually in small areas.

The surface horizon is 5 to 10 inches thick and is a black to grayish-black clay loam high in organic matter and nitrogen and alkaline in reaction. The grayish color is due to the presence of a large amount of disintegrating shell fragments. These shell fragments are highly calcareous and are an easily observed indicator of an alkali condition. The subsurface and subsoil do not vary greatly from those of Grundy clay loam except that shell fragments and secondary lime concretions are characteristic of Harpster clay loam.

Use and Management.—Since surface drainage is slow, tiling is necessary. Tile draw satisfactorily but in some areas provision for an outlet is difficult. This soil is not adapted to the small grains, as they tend to lodge. It is a good corn soil if well drained and treated with potash, straw, or coarse manure to overcome the bad effects of the alkali.

Huntsville loam, bottom (73)

Huntsville loam, bottom, occurs in most of the smaller creek bottoms and in much of the Illinois river bottom in Putnam county and occupies a total of nearly 11 square miles. This soil is derived from mixed sediments of recent origin, each flood adding or removing sediment. No distinct profile development has taken place, and no definite horizon separations can be made. The surface is, for the most part, a brown silt to sandy silt loam fairly high in organic matter and usually neutral in reaction. No true subsoil has developed. The material beneath

the surface soil to a depth of 30 or 40 inches is usually a brownish to drabbish yellow-mottled silt loam or sandy silt loam. Sometimes layers of sand or gravel occur but these are irregular in extent and occurrence.

Use and Management.—Huntsville loam is subject to overflow. It makes an excellent soil if protected by levee, but often the creek bottoms are too small and narrow for successful levee construction. It makes good pasture land, and much of it is now used for that purpose. The hazard of cropping is reduced by the growing of summer crops, since they can be planted and harvested between the usual flood seasons. No soil treatment is recommended because of frequent overflow.

O'Neill silt loam, terrace (79)

O'Neill silt loam, terrace, occupies nearly 10 square miles in Putnam county and occurs chiefly in two large areas, one near Putnam and the other near Hennepin. It is a medium-dark soil developed on the undulating to rolling terraces.

The surface is 5 to 8 inches thick and is a brown to light-brown silt loam medium in organic matter and nitrogen and acid in reaction. Some portions have a noticeable amount of coarse sand present. The subsurface is 6 to 8 inches thick and is a reddish-brown silt loam to sandy silt loam. The subsoil is 12 to 14 inches thick and is a reddish-yellow, medium-plastic, silty clay loam with some sand or small pebbles. Below 28 to 32 inches the material is loose, incoherent, coarse sand or gravel.

Use and Management.—Surface drainage is moderate, with only slight tendency toward erosion. Underdrainage is very rapid, and this soil for the most part is drouthy. Limestone and manure are recommended, tho permanent improvement may prove impractical, as the material below the subsoil is too coarse to hold moisture and is unfavorable to the penetration of roots by the deep-rooted crops. Therefore, even tho the surface may be well supplied with plant-food elements, crop yields may be cut by moisture deficiency.

Winter crops or early-season crops, such as wheat and oats, are better adapted to this soil than summer crops. Some deep-rooted crops, such as alfalfa and sweet clover, sometimes do fairly well. The underlying sand and gravel bed, which is known to be as much as 75 feet thick in places, is often used as a source of commercial sand and gravel.

Littleton silt loam, terrace (81)

Littleton silt loam, terrace, is a minor type in Putnam county, occupying a total of less than a square mile. It is a dark-colored soil that has developed on nearly level or gently undulating topography where the underlying terrace sand and gravel is more than 40 inches beneath the surface. The largest area in the county lies at the foot of the bluff south of the town of Putnam.

The surface is a brown to dark-brown silt loam high in organic matter and nitrogen and slightly acid in reaction. The subsurface and subsoil are similar to the corresponding strata in Muscatine silt loam except that the subsoil of Littleton does not show as much structural development as does that of Muscatine. The underlying sand and gravel strata are deep enough so that they do not influence moisture conditions adversely.

Use and Management.—The treatment and management practices suitable for this soil are the same as those suggested for Muscatine silt loam.

Sumner sandy loam, terrace (87)

Sumner sandy loam, terrace, occupies a total of a little over 5 square miles in Putnam county. It occurs, for the most part, as irregular sandy ridges in O'Neill silt loam to the northeast of Hennepin and on the terraces east of Senachwine lake. It is a medium-dark soil and has developed on undulating to rolling topography.

The surface is a brown to light-brown sandy loam medium low in organic matter and nitrogen and acid in reaction. The subsurface is a pale reddish-yellow sandy loam, and the subsoil a reddish-yellow sandy loam. The horizons are not well defined, the surface grading into the subsurface at a depth of 5 to 6 inches and the subsurface into the subsoil at 15 to 18 inches. Coarse sand and gravel are found at a depth of 45 inches or more.

Use and Management.—The sandy material from which Sumner sandy loam developed seems to have been deposited by the wind and it is still subject to wind movement where unprotected. Both surface and underdrainage are rapid, and the ridge tops tend to be drouthy. This soil responds well to good farming, including the use of limestone, legumes and manure, but unless well farmed, it deteriorates rapidly. It is advisable to use a short rotation on soil as open as Sumner sandy loam. The results from the Oquawka experiment field may be used in planning a treatment program for this soil.

Swan clay loam, bottom (107)

Swan clay loam, bottom, occupies a total area of about 6 square miles in Putnam county. It is a dark-colored, swampy, bottomland type, occurring in this county only along Illinois river. The largest area lies just to the south of Hennepin. This area is protected by levee and drained, and comprizes the only levee and drainage district in the county.

This soil is made up of very recent sediment of fine texture, and no definite horizon separations can be seen. The surface is a black to drabbish-black clay loam high in organic matter and nitrogen and neutral in reaction. Small areas in this type are lightly shelly; that is, they contain free calcium carbonate in the form of shell fragments and concretions. This condition is not prevalent, however. Below the surface soil the material usually becomes more silty and less clayey and somewhat more gray or drab in color with occasional yellowish mottlings.

Use and Management.—When protected by levee and drained, Swan clay loam is excellent corn land. The small grains make heavy growth and when conditions are favorable for rank vegetative growth, they tend to lodge at heading time. Sweet clover, red clover, and soybeans do well. In order to maintain good tilth it is advisable to apply barnyard manure or plow under a legume crop at regular intervals. No limestone or fertilizer treatment is recommended at this time, good farming including the use of legumes or manure being all that is necessary to maintain this soil in a good productive condition for some years.

Ellison silt loam, terrace (137)

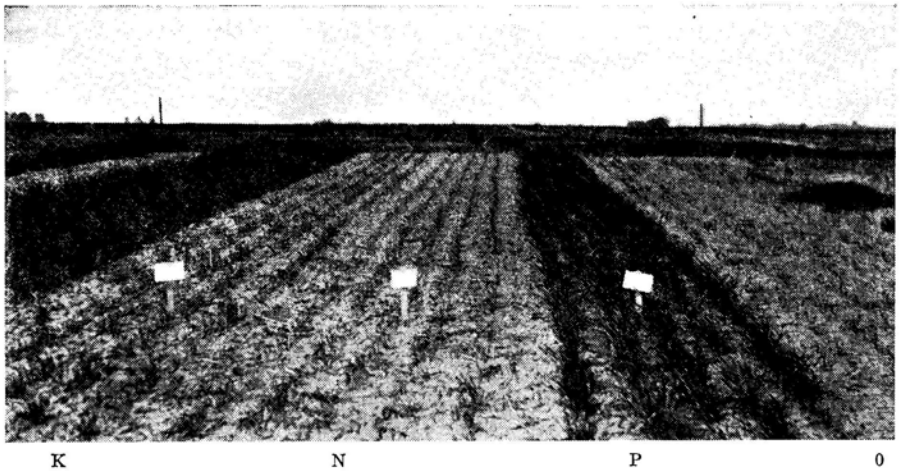
Ellison silt loam, terrace, is a minor type in Putnam county, occupying a total area of 1.34 square miles. It is a light-colored soil occurring on undulating to gently rolling topography and may be thought of as timbered O'Neill silt loam (79). The largest area lies along the bluff just to the southeast of Hennepin. Other small areas lie along many of the small side streams.

The surface is 5 to 7 inches thick and is a grayish-yellow silt loam low in organic matter and nitrogen and acid in reaction. The subsoil is a yellow to reddish-yellow, slightly-plastic, silty clay loam, usually becoming pebbly at 20 to 25 inches. Below 25 to 35 inches the material is loose, incoherent sand and gravel, as is the material underlying O'Neill silt loam.

Use and Management.—Surface drainage is moderate to rapid, and underdrainage is very rapid, making this soil drouthy. Some of the areas are still in timber, and it is best that they be left so. Those that are already cleared may be handled somewhat the same as O'Neill silt loam, tho they are somewhat poorer even than O'Neill because the organic-matter content is lower.

Saybrook silt loam (145)

Saybrook silt loam is a minor type in Putnam county, occupying a total area of less than a quarter square mile. The one important area in this county lies on the bluff front just to the east of Hennepin. It is a dark-colored soil that has



K N P 0

FIG. 8.—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.

developed on gently rolling to rolling topography. In this locality the loess deposit is now very thin or entirely absent, presumably because of removal by erosion, and the soils are derived from glacial till or from a combination of very thin loess and till.

In undisturbed areas the surface is 6 to 8 inches thick and is a brown silt loam medium high in organic matter and nitrogen and medium acid in reaction. The subsurface is a yellowish-brown silt loam extending to a depth of about 16 inches. The subsoil is 10 to 12 inches thick and is yellowish-brown, medium-plastic, silty clay loam. It breaks into weakly developed subangular aggregates ranging from ¼ to ¾ of an inch in diameter. In cultivated areas the horizons often are considerably thinner than as described above, owing to sheet erosion. Below 26 to 30 inches the material is pinkish-gray, friable, pebbly glacial till that is highly calcareous. Very often there is a 5- to 10-inch layer of friable silt on top of the pebbly glacial till, which is probably of loessial origin.

Use and Management.—Surface drainage is moderately rapid, and erosion is a serious problem. Underdrainage is moderate. The methods of erosion control best suited to any particular field depend on several factors. Fundamental to any method is a vigorous vegetative growth. With this in mind one should consider terracing, contour farming, strip cropping, and leaving the steeper slopes in permanent pasture or meadow. This is a good general agricultural soil, tho considerable injury has already occurred from erosion. Proper soil treatment and management and good cropping practices will insure satisfactory yields. Sweet clover and alfalfa do well following an application of limestone. A test for acidity should be made to determine the proper amount of limestone to apply. The application of a phosphate fertilizer is advisable in growing alfalfa.

Elliott silt loam (146)

Elliott silt loam is a minor type in Putnam county, occupying a total area of less than a quarter square mile. Three small areas lie on the upper bluff to the east of Hennepin. It is a dark-colored soil that has developed on undulating to gently rolling topography under grass vegetation. The principal difference between Elliott and Saybrook is that the former is underlain by a slowly permeable till which influences the underdrainage and has also influenced the character of the soil, particularly the subsoil.

The surface is 5 to 8 inches thick and is a brown silt loam fairly high in organic matter and nitrogen and slight to medium acid in reaction. The subsurface is 6 to 8 inches thick and is a yellowish-brown silt loam. The subsoil is 10 to 14 inches thick and is a drabbish-yellow, compact, medium-plastic, silty clay loam that breaks readily into ¼- to ¾-inch subangular to almost angular aggregates. In certain instances these three horizons may be somewhat thinner, especially where cultivation has permitted sheet erosion. Below 26 to 30 inches the material is a yellowish-gray, compact, rather fine-grained, highly calcareous glacial till. As in Saybrook, there is very often a 5- to 10-inch layer of friable silt on top of the till, which is probably of loessial origin.

Use and Management.—Surface drainage is moderate, underdrainage is slow, and it is for this reason that erosion is somewhat worse on this type on the same degree of slope than on Saybrook silt loam. Immediate attention to decreasing erosion losses is imperative if rapid and permanent deterioration is to be avoided. The control of erosion is more difficult on Elliott than on Saybrook because of

the larger runoff and because mechanical means of control are less applicable to this soil than to Saybrook. Contour tillage should be practiced and full use made of vegetative protection. The steeper slopes should be left in permanent pasture or meadow.

Onarga sandy loam (150)

Onarga sandy loam occupies a total area of a little less than one and a half square miles in Putnam county. The most important area lies about three miles directly west of McNabb. Other areas are to be found in the vicinity of Florid. This type is a medium dark-colored soil developed on undulating to rolling topography under grass vegetation.

The surface is 4 to 6 inches thick and is a brown to light-brown sandy loam medium to medium-low in organic matter and nitrogen and medium acid in reaction. The color of this horizon varies somewhat, being darker on the gentler slopes and lighter on the ridge tops. The subsurface is generally a pale reddish-yellow sandy loam, the color varying somewhat with the slope. The subsoil is a reddish-yellow slightly plastic sandy loam, which, however, becomes less sandy and more silty and clayey as the adjacent silt loams and clay loams are approached. Below 26 to 30 inches the material is a pale-yellow loose sand.

Use and Management.—The agricultural properties of this soil are so nearly like those of Sumner sandy loam that the reader is referred to the discussion of that type on page 22.

Drummer clay loam (152)

Drummer clay loam is of very minor importance in this county, occupying a total area of only .10 square mile east and southeast of Magnolia. Except that it contains a slightly greater percentage of sand and pebbles thruout the profile and is derived from glacial wash rather than from loess, it does not differ greatly from Grundy clay loam.

Use and Management.—Its treatment and management requirements are the same as those of Grundy clay loam discussed on page 19.

Clinton sandy loam (185)

Clinton sandy loam occupies a total area of nearly 4 square miles in Putnam county. It is a light-colored soil derived from wind-blown sandy material deposited on the upland and developed on undulating to rolling topography under deciduous forest vegetation. It occurs only east of the river as a more or less disconnected band lying partly on top of the Illinois river bluff and partly on its front from Moronts to within about four miles of the Marshall county line.

The surface is 4 to 6 inches thick and is a grayish-yellow sandy loam low in organic matter and nitrogen and acid in reaction. There is some variation in the amount of gray present, depending on degree of slope. The subsurface is a grayish-yellow to yellow sandy loam. The subsoil is a grayish-yellow to yellow, or somewhat reddish-yellow on the slopes, slightly plastic sandy loam to sandy clay loam. The subsoil becomes less sandy as the boundary between this soil and the adjacent silt loam types is approached. Below 26 to 30 inches the material is

normally a pale-yellow incoherent sand, tho the sandy strata are sometimes thin and the underlying material may be calcareous glacial till. These latter areas, however, are small.

Use and Management.—Surface drainage is moderate to rapid, and underdrainage is rapid. The higher knoll and ridge tops are very light, thin, and drouthy, are subject to harmful wind erosion if left unprotected, and are not

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.

good crop land tho a fair stand of alfalfa may be secured after liming. Heavy applications of manure help to improve the stand of alfalfa.

All of this type would best be left in timber, but where it has been cleared it should be handled in the same way as Sumner sandy loam, discussed on page 22.

Ellison sandy loam, terrace (209)

Ellison sandy loam, terrace, occupies a total of about one and a third square miles in Putnam county. It occurs in small areas along the base of the bluff on the east side of Illinois river. It is a light-colored sandy terrace type and may be thought of as a light-colored O'Neill sandy loam.

Use and Management.—This soil should be left in timber or returned to timber if already cleared.

Huntsville gravelly loam, bottom (222)

Huntsville gravelly loam, bottom, occupies a total of nearly one and a half square miles in Putnam county. It is made up of coarse sandy and gravelly material washed into the small stream bottoms where these bottoms cross the broad Illinois river terraces. In some places the material is freshly deposited sand and gravel and is of little agricultural value, while elsewhere some silty sediment has been carried in from the uplands and the resulting mixture may be successfully cropped, tho yields will generally be low. As in the other related bottomland types, no soil horizons can be distinguished. Besides being subject to seasonal overflow, this soil is drouthy whenever the water table is lowered.

Use and Management.—This is not good cropland and should be used for pasture or planted to trees.

Varna silt loam (223)

Varna silt loam is a minor type, occupying only about a third of a square mile in Putnam county. It is a medium dark-colored soil derived from a thin loess cover on compact, calcareous glacial till. It has developed on strongly rolling topography under grass vegetation and may be thought of as strongly sloping Elliott. The most important areas lie to the southeast of Moronts.

In undisturbed areas the surface is 4 to 5 inches thick and is a brown to light-brown silt loam medium in organic matter and nitrogen and medium to slightly acid in reaction. The subsurface is 4 to 6 inches thick and is a brownish-yellow silt loam. The subsoil is 10 to 14 inches thick and is a yellowish-brown, medium-plastic, silty clay loam. All of these horizons may be thinner or even entirely absent in certain areas under cultivation where erosion has been allowed to proceed unchecked. Below 24 to 30 inches the material is a compact, highly calcareous glacial till. Occasionally a 6- to 8-inch silty layer occurs on top of the till, as was described as occurring in Saybrook and Elliott areas.

Use and Management.—Surface drainage is rapid and underdrainage is slow, a combination that is conducive to very serious loss of soil material by erosion unless extreme care is used to guard against it. For the most part this soil should not be cultivated but should be returned to grass. A light application of limestone and some barnyard manure will help to secure a growth of grass. If used for pasture, care should be exercised not to overgraze it. If it is necessary that this soil be kept in cultivation, strip cropping and contour farming should be immediately adopted. Corn should not often be included in the rotation. Those crops should be used as much as possible which will furnish a winter cover for the land. The addition of fresh organic matter will increase the vegetative growth on this soil and help to reduce erosion losses.

SUMMARY OF CHARACTERISTICS OF PUTNAM COUNTY SOILS

The agriculturally more important characteristics of the soil types shown on the Putnam county soil map included in this report are summarized in Table 3. 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; and, in the case of soils rating 5 or poorer for the common field crops, ratings for pasture and for timber also are given.

The scale used for expressing relative producing capacity for the common field crops is 1 to 10, 1 representing the highest producing capacity and 10 the lowest. "Producing capacity" is defined as the ability of a soil to produce the crops common to the region without soil treatment but when well drained and farmed in the manner common to the region.

Soils differ in their capacity to respond to soil treatment, and this difference is not brought out in Table 3. Clinton silt loam, for example, rating 5, responds well to good soil treatment and management methods, while O'Neill silt loam, rating 7, is disappointing in its response. For a discussion of this matter the reader is referred to the management paragraph under each soil type.

All soils rating 5 or poorer for field crops are also rated A, B, and C for pasture and for timber. In this comparative scale A represents the best and C the poorest.

TABLE 3.—PUTNAM 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	12	Gently rolling to rolling	Moderate	Moderate	Acid	Low	Low	5	A	A
23	Blount silt loam	13	Rolling to strongly rolling	Rapid	Slow	Acid	Low	Low	6–7	B	A
24	Miami silt loam	14	Rolling to strongly rolling	Rapid	Moderate	Acid	Low	Low	5	A	A
25	Hennepin gravelly loam, eroded	15	Steep	Excessive	Moderate	Variable	Variable	Low	10	C	B
36	Tama silt loam	15	Rolling	Moderate to rapid	Moderate	Acid	Low	Medium	3–4	..	..
37	Worthen fine sandy loam, bluff wash	16	Undulating to rolling	Moderate	Moderate	Variable	Variable	Variable	3–8	..	..
41	Muscatine silt loam	17	Undulating to gently rolling	Moderate	Moderate	Medium acid	Medium	Medium to high	2	..	..
43	Grundy silt loam	18	Nearly level	Slow	Moderate	Neutral	High	High	1	..	..
63	O'Neill sandy loam, terrace	19	Undulating to rolling	Moderate	Excessive	Acid	Low	Low	9	C	B
65	Grundy clay loam	19	Nearly level	Slow	Moderate	Neutral	High	High	1	..	..
67	Harpster clay loam	20	Nearly level	Slow	Moderate	Alkaline	High	High	4	..	..
73	Huntsville loam, bottom	20	Nearly level to undulating	Slow	Moderate	Neutral	High	High	3–5	A	A
79	O'Neill silt loam, terrace	21	Undulating to gently rolling	Moderate	Excessive	Acid	Low	Medium	7	B	B
81	Littleton silt loam, terrace	21	Nearly level to undulating	Moderate	Moderate	Acid	Medium	Medium to high	2–3	..	..

(Table is concluded on page 30)

TABLE 3.—PUTNAM COUNTY SOILS (*Concluded*)

87	Sumner sandy loam, terrace...	22	Undulating to rolling	Moderate	Rapid	Acid	Low	Medium to low	7–9	B	A
107	Swan clay loam, bottom.....	22	Nearly level	Slow	Moderate	Neutral	High	High	2–6	A	A
137	Ellison silt loam, terrace.....	23	Undulating to gently rolling	Moderate	Excessive	Acid	Low	Low	9	C	B
145	Saybrook silt loam.....	23	Gently rolling to rolling	Moderate to rapid	Moderate	Acid	Low to medium	Medium to high	3	..	..
146	Elliott silt loam.....	24	Undulating to rolling	Moderate to rapid	Slow	Acid	Low to medium	Medium to high	4	..	..
150	Onarga sandy loam.....	25	Undulating to rolling	Moderate	Rapid	Acid	Low	Low	6	B	A
152	Drummer clay loam.....	25	Nearly level	Slow	Moderate	Neutral	High	High	1	..	..
185	Clinton sandy loam.....	25	Undulating to rolling	Moderate to rapid	Moderate to rapid	Acid	Low	Low	7	B	A
209	Ellison sandy loam, terrace...	26	Gently rolling	Moderate	Excessive	Acid	Low	Low	9	C	B
222	Huntsville gravelly loam, bottom.....	27	Undulating	Moderate	Excessive	Variable	Low	Low	9	C	B
223	Varna silt loam.....	27	Strongly rolling	Rapid	Slow	Acid	Low	Medium to low	6–8	B	B

[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 desirable 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. The rating for pasture and for forest land is expressed by the letters A, B, and C, A representing the best and C the poorest.

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 Du Page, 1917
17 Kane, 1917
18 Champaign, 1918
19 Peoria, 1921
20 Bureau, 1921
21 McHenry, 1921
22 Iroquois, 1922
23 DeKalb, 1922
24 Adams, 1922
25 Livingston, 1923
26 Grundy, 1924
27 Hancock, 1924
28 Mason, 1924
29 Mercer, 1925
30 Johnson, 1925
31 Rock Island, 1925
32 Randolph, 1925
33 Saline, 1926
34 Marion, 1926
35 Will, 1926
36 Woodford, 1927
37 Lee, 1927
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41 Henry, 1928
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46 Edwards, 1930
47 Piatt, 1930
48 Effingham, 1931
49 Wayne, 1931
50 Macoupin, 1931
51 Fulton, 1931
52 Fayette, 1932
53 Calhoun, 1932
54 Ford, 1933
55 Jackson, 1933
56 Schuyler, 1934
57 Clinton, 1936
58 Washington, 1937
59 Marshall, 1937
60 Putnam, 1937

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PUTNAM COUNTY SOIL MAP

THE LOCATION of each soil type in Putnam county is indicated on this map. 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 type.

For a description of each type and a statement of its best use and recommended management, see pages 11 to 30, consulting *Contents*, page 2, for exact page references.

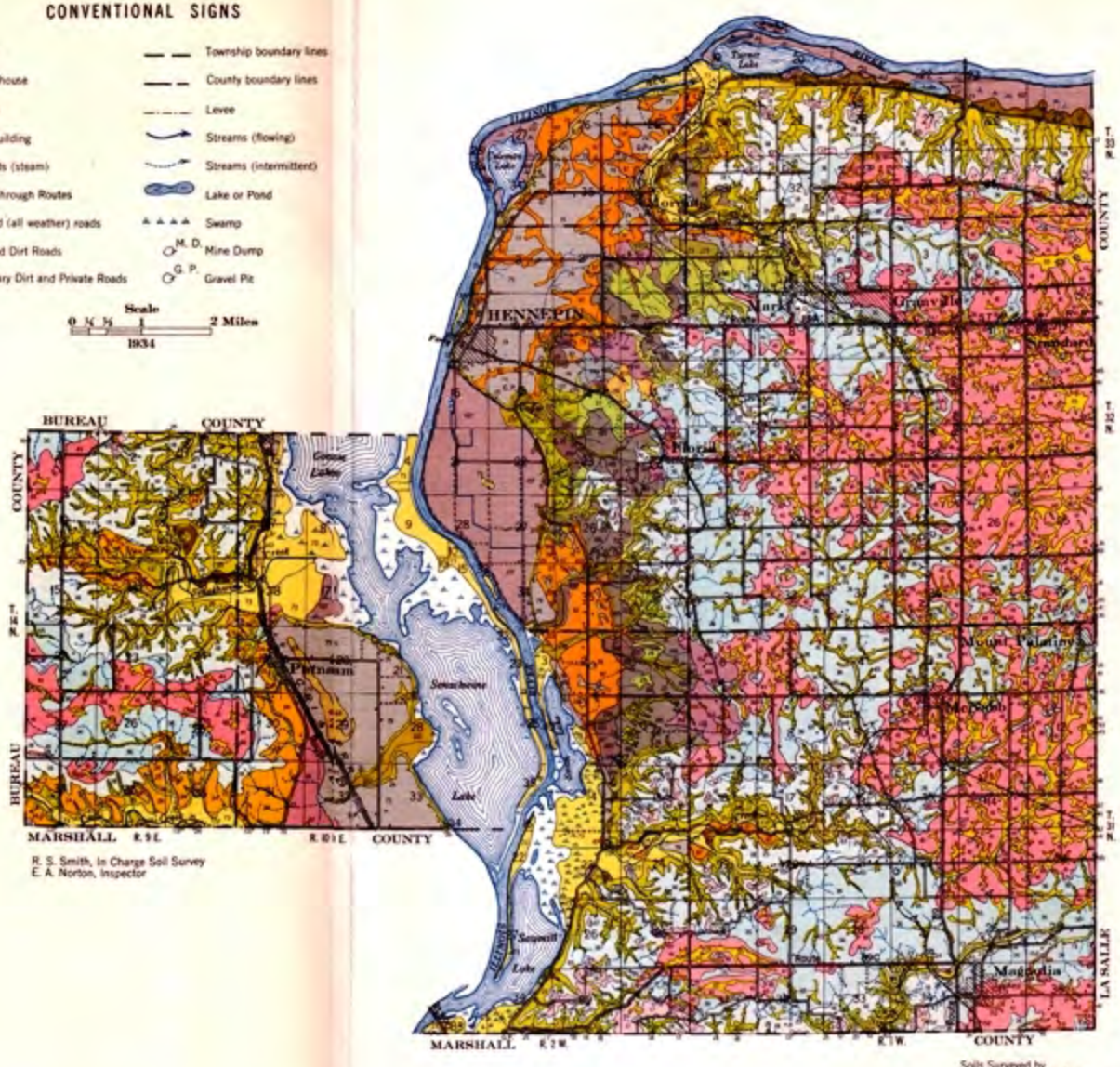
LEGEND

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
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
107	Swan clay loam, bottom
137	Ellison silt loam, terrace
145	Seybrook silt loam
146	Elliott silt loam
150	Onarga sandy loam
152	Drummer clay loam
185	Clinton sandy loam
208	Ellison sandy loam, terrace
222	Huntsville gravelly loam, bottom
223	Varna silt loam

CONVENTIONAL SIGNS

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

Scale
0 ¼ ½ 1 2 Miles
1934



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J. E. Gieseking
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SOIL SURVEY MAP OF PUTNAM COUNTY

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