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Agricultural Experiment Station

SOIL REPORT No. 53

CALHOUN COUNTY SOILS

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AND L. H. SMITH

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The Soil Survey of Illinois was organized under the general supervision of Professor Cyril G. Hopkins, with Professor Jeremiah G. Mosier directly in charge of soil classification and mapping. After working in association on this undertaking for eighteen years, Professor Hopkins died and Professor Mosier followed two years later. The work of these two men enters so intimately into the whole project of the Illinois Soil Survey that it is impossible to disassociate their names from the individual county reports. Therefore recognition is hereby accorded Professors Hopkins and Mosier for their contribution to the work resulting in this publication.

[1]Engaged in Soils Extension as well as in Soil Experiment Fields.

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 any comprehensive plan of soil improvement looking toward the permanent maintenance of our agricultural lands, a definite knowledge of the various existing kinds or types of soil is a first essential. 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. In this connection special recognition is due Mr. O. I. Ellis, who, as leader of the field party, was in direct charge of the mapping.

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CALHOUN COUNTY SOILS

By R. S. SMITH, E. E. DeTURK, F. C. BAUER, and L. H. SMITH[1]

GEOGRAPHICAL FEATURES OF CALHOUN COUNTY

CALHOUN COUNTY is located between the Mississippi and Illinois rivers, forming a long neck of land between these two streams. It is slightly over 36 miles long from north to south and varies in width from about 4 miles to about 16 miles. It occupies a total area of 281.57 square miles, including swamps, rivers, and lakes.

No railroads have been built in Calhoun county, transportation being mainly by water, either on the Illinois or the Mississippi river.

The county was established by act of the Legislature in 1825 and Hardin, the county seat, was founded in 1847. Fig. 1 shows the population from 1830 to

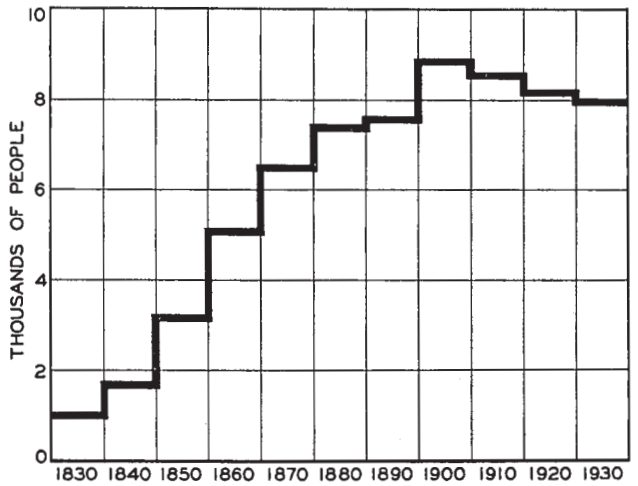

FIG. 1.—GROWTH IN POPULATION OF CALHOUN COUNTY

Population reached its maximum in the first decade of the present century, since which time it has declined.

1930. It will be noted that there was a slow but steady increase in population during the seventy-year period 1830 to 1900, and that during the thirty-year period following there was a decrease of about 900 inhabitants.

History of Agricultural Production

Calhoun county is known as a fruit-producing county and the fact that it also produces a considerable acreage of corn and wheat is frequently lost sight of. Fig. 2 shows the acreage of corn, oats, and wheat at ten-year intervals from 1880 to 1930 inclusive. It will be seen that thruout the past fifty years 15,000

[1]R. S. SMITH, Chief in Soil Physics, in charge of identification and mapping of soil types; E. E. DeTURK, Chief in Soil Technology, in charge of soil analysis of the Soil Survey; F. C. BAUER, Chief in Soil Experiment Fields; L. H. SMITH, Chief, in charge of Publications of the Soil Survey.

to 20,000 or more acres of corn are usually grown, and that, with the exception of the last Census year, the wheat acreage has almost equaled, or even exceeded, the corn acreage. Oats are a minor crop in this county, the recorded plantings ranging between 1,000 and 3,000 acres. Considerable land is also devoted to the production of hay. The 1930 U. S. Census records an acreage of 10,400 for tame hay. The U. S. Department of Agriculture gives the following average crop yields for the ten-year period 1921 to 1930: corn, 38.8 bushels an acre; winter wheat, 17.0; oats, 25.1; and tame hay, 1.65 tons. As a six-year average spring wheat produced 13.9 bushels an acre.

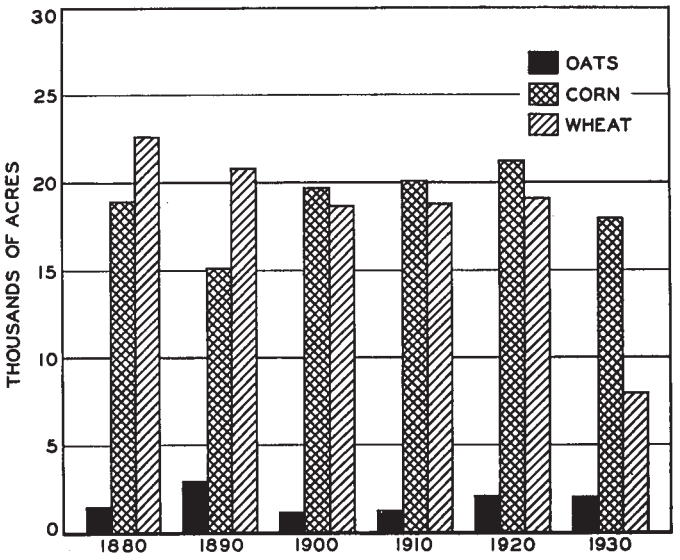

FIG. 2.—ACREAGE OF CORN, OATS, AND WHEAT IN CALHOUN COUNTY
The diagram shows the relative acreage devoted to the three principal grain crops at periodic intervals since 1880. (Figures from U. S. Census)

Three leguminous crops that have been rapidly gaining in favor in Illinois during the past few years are alfalfa, sweet clover, and soybeans. Twelve hundred acres of alfalfa were cut for hay in Calhoun county in 1929, and 1,475 acres of sweet clover were grown. The soybean has scarcely got a foothold, the amount recorded being 140 acres for the beans grown alone and 100 acres grown as a companion crop. However, 800 acres of cowpeas were grown.

The importance of Calhoun as a fruit county is indicated by the number of its apple trees, which increased from 127,000 in 1890 to 780,000 in 1925. Apples equivalent to 1,275 carloads were shipped out of the county in 1929, according to figures reported in "Illinois Crop and Livestock Statistics." Fruits other than apples and grapes are of little importance. Vegetable crops are of no commercial importance.

Livestock is of secondary importance in Calhoun county. Transportation conditions are not favorable to this industry, and the hilly land affords but relatively little pasture. The trend of livestock production since 1850 is shown in Fig. 3.

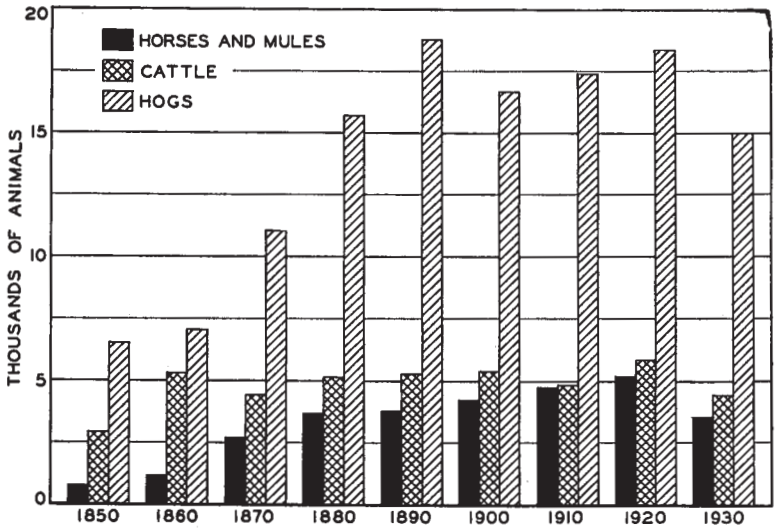

FIG. 3.—NUMBER OF HORSES AND MULES, CATTLE, AND HOGS IN CALHOUN COUNTY

The diagram shows the relative numbers of the principal classes of livestock at periodic intervals since 1850. (Figures from U. S. Census)

The number of horses reached a maximum in 1920; then declined almost 40 percent by 1930. The number of mules increased slowly but constantly until 1930, when there were almost exactly half as many mules as horses. Little change has occurred since 1890 in the number of hogs. The number of cattle has been fairly constant since 1860, the smallest number for the last seventy years being reported

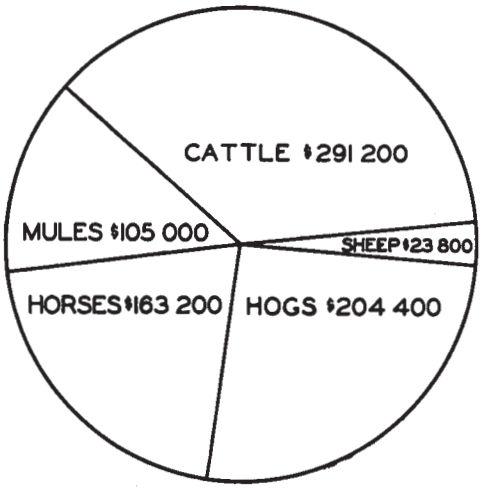

FIG. 4.—RELATIVE VALUE OF THE MORE IMPORTANT CLASSES OF FARM ANIMALS IN CALHOUN COUNTY, 1930

(Data from "Illinois Crop and Livestock Statistics," Circular 409, Illinois Department of Agriculture; U. S. Department of Agriculture cooperating.)

in 1930. The value of the main classes of farm animals, including sheep, was given as $787,600 in 1930. Fig. 4 indicates how this value was distributed.

Climate

No U. S. Weather Bureau station is located in Calhoun county. Griggsville, in Pike county, about 20 miles north of the Calhoun county line, most nearly represents the climatic conditions in Calhoun county. Altho the records at that point are not altogether complete, they furnish a very good idea of the principal climatic features.

The mean summer temperature at Griggsville for the period from 1892 to 1930, thirty-nine years, was 74.7° and the mean winter temperature, 30.9°. The lowest temperature recorded was 25° below zero in 1905; the highest was 110° in 1901. Thus there is a wide range between the extremes of winter and summer. The average date of the first killing frost in the fall is October 20; the earliest one recorded occurred September 25, 1928. The average date of the last killing frost in the spring is April 17; the latest one recorded occurred May 21, 1892. The growing season averages 186 days; the shortest growing season recorded was 141 days in 1894, and the longest 227 days in 1929.

The average annual rainfall for the period from 1916 to 1930 was 37.15 inches. The average rainfall for the six-months period from April to September inclusive was 24.45 inches. The lowest rainfall for this period was 14.24 inches in 1930; the highest, 35.17 inches in 1926. The heaviest rainfall for any one month was 16.83 inches in September, 1926; the lowest was .51 of an inch in July, 1930. The average snowfall for thirteen years was 17.9 inches.

The question is often raised whether the rainfall is well distributed thru months of crop growth or whether crops are affected by periods of drouth. This is a difficult question to answer because the length of the rainless period is but one of the factors responsible for crop damage. Other factors include amount and character of rain preceding rainless periods; humidity, sunshine, temperature, and wind velocity during the rainless period; and the character of the soil. Then there are also to be considered the crop's reaction to drouth conditions and its stage of growth. With these complex factors in mind it is of interest to note that in the seventeen-year period from 1914 to 1930 there were only three years during which one or more rainless periods of 20 days or longer did not occur during the growing season. During this period there was one rainless period of 41 days, one of 59 days, and one of 63 days. Rainless periods of about 10 days were frequent. Rainless periods of about 20 days are likely to injure grain crops but not orchard trees. Rainless periods that exceed 40 days may be harmful to orchards, tho the deep-rooting habit of the trees in Calhoun county suggests that they would be especially able to resist the damaging effects of rainless periods.

Physiography and Drainage

Calhoun county lies in the form of a long, rugged ridge between Illinois and Mississippi rivers. The crest of the ridge varies in elevation between 700 and 760 feet and divides the county into approximately equal parts, the western side of the divide draining into Mississippi river and the eastern side into Illinois river. The entire upland portion of the county, with the exception of fifteen to twenty

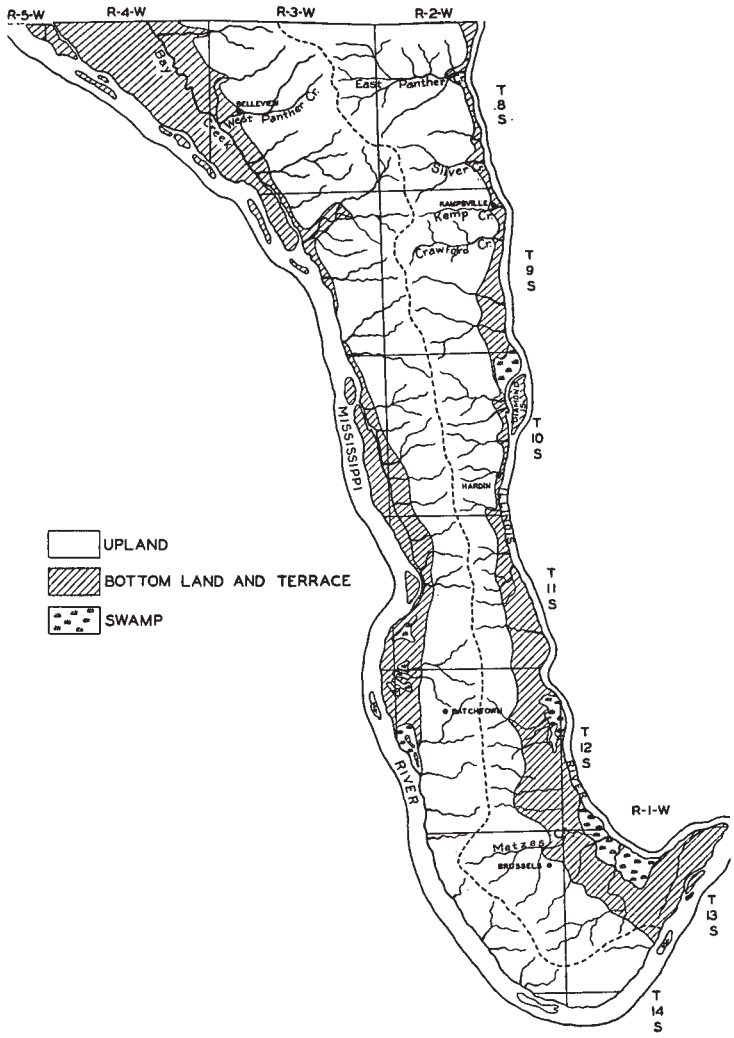

FIG. 5.—DRAINAGE MAP OF CALHOUN COUNTY SHOWING STREAM COURSES, BOTTOM LANDS, AND SWAMPS

square miles in the southern end, is very rough and broken. The divides are narrow and irregular in outline and are constantly being made narrower by erosion. Drainage thruout the upland portion of the county is well developed, and the run-off is excessive and rapid. The soils are resistant to erosion in part because of their good absorptive capacity and in part because loess, which constitutes so much of the soil material, is not readily eroded. Yet, because of the steepness of the slopes, erosion has been and still is very active.

The bottom lands along both Mississippi and Illinois rivers are in part swampy and are very largely subject to overflow. Fig. 5 shows the bottom lands and swamps and the drainage of the county. The dotted line marks the divide.

The elevation at the junction of Illinois and Mississippi rivers is about 420 feet above sea level. At Hamburg the elevation is 445 feet and the divide three miles

east of Hamburg has an elevation of 750 feet. The highest point on the Calhoun-Pike county boundary line is 720 feet above sea level.

FORMATION OF CALHOUN COUNTY SOILS

One of the most important agencies in the formation of the great majority of our Illinois soils was the glaciers, for it was thru glacial action, either direct or indirect, that the materials out of which our present soils are formed were deposited.

At the time of the glaciers the climate was much colder than at present. Snow and ice accumulated in regions to the north in great masses and then pushed outward from these centers. The movement of these great accumulations of snow and ice was chiefly southward. In this movement across the country the glaciers gathered up all sorts and sizes of materials, including clay, sand, gravel, boulders, and even immense masses of rock. Some of these materials were carried hundreds of miles and rubbed against surface rocks and each other until largely ground into powder. Under the enormous pressure of the ice, hills were leveled off and valleys filled in, thus greatly changing the features of the surface over which the ice sheet passed. When the glaciers reached areas of warmer temperatures, the movement was checked. As the climate became warmer the ice melted back rapidly, leaving the mixture of mineral material scattered over the land. Such a mixture of materials deposited directly from the glacier is known as glacial drift, and soils formed from this drift are called drift soils.

Loess is another soil material derived thru glacial action but in a more indirect manner than drift. Much fine sediment carried along in the immense volumes of water from the melting glaciers settled in great quantities in stream bottoms. The streams later dried up and this fine, silty deposit was picked up by the wind and carried for miles across the country, then redeposited over the land. The upper portion of this loess blanket, under the weathering conditions explained below, was then gradually transformed into soil.

Origin of Soil Material

Calhoun county itself is largely unglaciated. The soils are derived from loess, with the exception of those in the bottom lands, which are derived from sedimentary material deposited by running water. Over most of the county the loess rests directly on the underlying bed rock. The loess is sufficiently thick so that the entire soil profile[1] is developed from it. The character of the soils developed from the loess has, however, been strongly influenced by the topography. Their permeability and the absence of impervious strata in the profile are explained by the good drainage conditions under which they developed. Had this county been glaciated and the loess been deposited on a till plain, the soils developed from the loess would have been very different from those that occur.

The loess deposited in Calhoun county was not all laid down during one period. Several glacial advances occurred, and following each there was an interglacial stage during which conditions were favorable for the deposit of much

[1]For meaning of the term "profile" as used in soil literature, see Fig. 6, page 9.

of the loessial sediment. Three distinct deposits probably occurred. The oldest, known as the Sangamon, was laid down following the retreat of the Illinoian glacier. This deposit was heavy. After a long period another loess sheet was deposited. The third and last deposit was made following the retreat of the last glacier, known as the Wisconsin.

The character of a loess soil, besides being influenced by topography, depends to some extent upon the particular sheet from which it was developed. At the time the soil map of Calhoun county was made it was not possible to differentiate the various loess sheets, and the map therefore does not show all these variations. Type 18, however, is the only one to which the deficiency applies, for the material on slopes sufficiently steep to be mapped as No. 5 is a mixture of all the loess sheets.

FIG. 6.—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."

Soil Development

The upland soils in Calhoun county developed under a forest cover and are therefore all deficient in organic matter. The good drainage conditions which made the growth of timber possible were favorable for the development of a permeable profile. For this reason there is no clay-pan subsoil or tight clay in this county.

Erosion has been so active in Calhoun county that there is at present an aggregate area of only about 60 square miles upon which a true soil profile has developed. This profile has developed on a calcareous loess under conditions of good drainage, so that a friable, permeable profile with a rather poorly defined subsoil has resulted. The processes of soil weathering have leached the carbonates from the upper 4 to 8 feet, necessitating the application of limestone

for the growing of clovers. The depth to carbonates varies, depending upon the amount of erosion that has occurred and the thickness of the loess sheets. In regions where the youngest loess still remains and is thick enough to be effective, calcareous material occurs at a depth of about 4 feet. In regions where the later loess deposits were originally thin or where they have been removed by erosion, the depth to carbonates is great, for the oldest loess was already leached of its carbonates even before later loess deposits were laid down.

SOIL CLASSIFICATION AND MAPPING

The soil type is the unit of classification in a soil survey. Each type thruout the area of its occurrence, has the same soil characteristics and the same potential productivity tho it may differ, even on a single farm, in present producing power because of differences in the way the land has been managed. The descrip-

TABLE 1.—SOIL TYPES OF CALHOUN COUNTY, ILLINOIS

Soil type No.	Name of type	Area in square miles	Area in acres	Percent of total area
5	Eroded Silt Loam	110.42	70 669	39.22
18	Brownish Yellow-Gray Silt Loam	59.93	38 355	21.28
134	Brownish Yellow-Gray Silt Loam Over Sand Or Gravel	3.89	2 489	1.38
87	Brown Sandy Loam On Sand Or Gravel	2.23	1 427	.79
81	Brown Silt Loam Over Sand Or Gravel	1.02	653	.36
37	Light Brown Fine Sandy Loam	.75	480	.27
107	Deep Black Clay Loam	3.48	2 227	1.23
69	Black Clay	.75	480	.27
70	Drab Clay Loam	4.82	3 085	1.71
71	Drab Clay	1.97	1 260	.70
73	Brown Mixed Loam	22.39	14 330	7.95
74	Mixed Sandy Loam	4.05	2 592	1.44
77	Deep Brown Silt Loam	18.94	12 122	6.73
142	Mixed Loam (Overflow)	17.64	11 290	6.27
	Swamp	6.23	3 987	2.21
	Rivers and Lakes	23.06	14 758	8.19
	Total	281.57	180 204	100.00

tions that follow are intended to give a fairly clear idea of the characteristics of each type and to be of assistance in planning efficient management practice. For convenience, each type is given a number as well as a name.

Failure to appreciate the fact that soil types are differentiated on the basis of the character of the entire profile and not of the surface soil alone often makes it difficult to understand what is meant by "soil type." It often happens that the surface soil of one type is no different from that of another type, and yet the two types may be widely different in character and in agricultural value. It is of the utmost importance, therefore, in studying descriptions of soil types to get a clear mental picture of the outstanding features of each type. This cannot be done without some real study, as there is no easy road to soil knowledge.

The accompanying soil map, shown in two sections, gives the location and boundary of each soil type in Calhoun county and indicates the position of

streams, roads, and towns. Table 1 lists these types, gives the area of each in square miles and in acres and also the percentage each constitutes of the total area of the county.

DESCRIPTION OF SOIL TYPES

There are but two upland soil types mapped in Calhoun county. One of these, No. 18, has a fairly well-developed profile; the other, No. 5, shows very little profile development and in many places none at all. The bottom-land soils show little and sometimes no profile development. The soil features that are developed by weathering are, with the exception of one type, very faint or are entirely absent. Calhoun county would therefore not be chosen by one who wished to study soils and their formation.

Eroded Silt Loam (5)

Eroded Silt Loam is the most extensive soil type in Calhoun county, occupying a total of 110.42 square miles, or about 39 percent of the area of the county. This type is largely unsuited to general farming because of its topography. It

FIG. 7.—A WELL-KEPT YOUNG ORCHARD ON ERODED SILT LOAM

Slopes such as this, which are short and only moderately steep, erode badly under general farming but may be used for orcharding without causing serious erosion.

is now used in part for orcharding, but much of it is too steep for this purpose. Many of the slopes are occupied by scrub timber and are used as timber pasture.

Considerable variation may be noted in the character of this soil because of differences in the rate at which erosion has occurred on the various slopes and also because of differences in the thickness of the various loess sheets. On the more moderate slopes which have been well protected by a forest cover a faint development into surface, subsurface, and subsoil strata can be seen. The type as a whole, however, shows no profile development because the soil material has been removed by erosion more rapidly than a soil profile could be developed by

the soil-forming forces. In places, as indicated on the map, there are outcrops of sandstone or of limestone and in the northeastern corner of the county there are many small areas of stony loam.

Management.—The only changes which might be suggested for the utilization of this land are that the more moderate slopes be used for sweet-clover pasture and that the underbrush be cleared from the more favorable sites for timber growth. Both these changes would require the expenditure of labor, and in order to grow sweet clover, limestone would have to be applied, necessitating a money outlay. Orcharding probably should not be greatly extended on this land because the cost of spraying and other operations is greater than on other land with a more favorable topography. A well-kept young orchard located on a moderately steep slope having soil mapped as No. 5 is shown in Fig. 7. Slopes of this character may be used to good advantage for orcharding.

Brownish Yellow-Gray Silt Loam (18)

Brownish Yellow-Gray Silt Loam is the best soil in Calhoun county for general farming and orcharding. It occurs in narrow, irregular areas on the divides thruout most of the county but in the extreme southern part of the county the divides are lower and broader. This soil is derived from loess and was developed under good drainage conditions under a forest vegetation. It is not altogether uniform, as previously noted, because of variation in the thickness of the loess sheets from which its was derived. Since at the time the county was surveyed it was impossible to differentiate the various loess sheets, variations now known to exist are not shown on the soil map. It should be noted that the broader areas of this type in the southern part of the county have a somewhat darker surface soil and a better developed subsoil than are formed farther north in the county. This difference is due to a thicker blanket of recent loess and to less rolling topography.

This type is characterized by a brownish gray, friable silt loam surface soil which is about 5 to 7 inches thick. Near the Mississippi bottom the texture is somewhat coarser than it is farther inland, where it approaches a fine sandy loam. The subsurface is also friable, and is yellowish gray with a distinct reddish cast on the more rolling areas. The subsoil is encountered 12 to 16 inches below the surface. It varies from reddish brown to reddish yellow. On nearly flat areas this horizon shows a distinctly gray cast, which is due to a gray powdery coating that covers the somewhat angular aggregates more or less completely. The subsoil extends to a depth of about 30 inches. Below this depth the character of the material varies according to the loess sheet from which it was derived.

Management.—Brownish Yellow-Gray Silt Loam is medium acid, low in organic matter and nitrogen, and portions of the type are sufficiently sloping to permit erosion. It is a friable soil and permeable thruout the profile. It is this latter characteristic that makes it especially well adapted to orcharding since it allows deep penetration of tree roots.

The first step in improving this soil, either for general farming or for orcharding, is to apply sufficient limestone to grow clover, preferably sweet clover. The amount of limestone to apply should be determined as directed in Circular

346 of this Station. When this has been done, the nitrogen and organic-matter deficiencies of the soil can be taken care of by the frequent growing of a clover crop. On areas that tend to erode, a cropping system should be adopted that will afford a protective cover during as much of the year as possible. It is surprising how effective a good cropping system is in reducing erosion, particularly on a soil such as this which absorbs water readily. There are times, however, when a certain amount of erosion is inevitable, as for example, in the spring when the subsurface is frozen and thus prevents absorption of water.

After the nitrogen and organic-matter deficiencies have been corrected and provision has been made for reducing erosion on the slopes, the soil should be tested for available phosphorus. If the test shows a deficiency of available phosphorus, the use of a phosphate fertilizer should be considered. Potash may be deficient, but unfortunately there is at present no simple test known for available potash as there is for available phosphorus. One way to determine the need for potash is to make some trial applications. This material, if used, should be applied for the corn crop, for corn responds to potash better than do small grains.

Brownish Yellow-Gray Silt Loam Over Sand Or Gravel (134)

Brownish Yellow-Gray Silt Loam Over Sand Or Gravel is very similar to Type 18 previously described. It differs somewhat in topography, being flat and sloping gently towards the stream course which it borders. This type was developed on stream terraces, and so differs geologically from Type 18. It is unimportant so far as extent is concerned, as it occupies a total of less than four square miles in the county.

Management.—The same management suggestions apply to this type as are made for Type 18, just described.

Brown Sandy Loam On Sand Or Gravel (87)

Brown Sandy Loam On Sand Or Gravel covers a total of only two and a quarter square miles. The largest areas occur in the southeastern part of the county near Centerville and Deer Plain; in fact Deer Plain is located on this type. The surface stratum consists of a brown sandy loam. At a depth of about 10 inches the soil becomes yellowish, and a few inches deeper is an incoherent yellow sand.

Management.—This soil is likely to be drouthy but it is well adapted to orcharding and to the growing of crops that like a sandy soil. It is unwise to attempt to build up much of an organic-matter surplus in this soil because of its open, leachy nature. Where clovers are to be grown, a medium application of limestone is required.

Brown Silt Loam Over Sand Or Gravel (81)

Brown Silt Loam Over Sand Or Gravel is a minor terrace type, occupying a total of only one square mile. Because of their location, the areas of this type have accumulated sufficient organic matter to give a dark color to the surface soil. This type is now drouthy, but with good farming, including the use of legumes, it will produce good grain crops. It is somewhat acid and should be tested

in detail, as recommended in Circular 346 of this Station, to determine just how much limestone to apply.

Light Brown Fine Sandy Loam (37)

Light Brown Fine Sandy Loam is a minor bottom-land type, occupying three quarters of a square mile. It forms a long, narrow, low ridge in the southeastern part of the county. It occurs as a natural levee, marking the bank of a former course of Mississippi river.

The surface soil is a light brown fine sandy loam. At a depth of about 8 inches and extending to about 20 inches, the color is brownish gray. Below 20 inches the color becomes slightly reddish brown and the material is compact but very friable.

Management.—This type is well drained and is easy to till. It is low in nitrogen and organic matter and is somewhat acid. It is not drouthy, and with good farming, including the growing of legumes, should produce very good crops.

Deep Black Clay Loam (107)

Deep Black Clay Loam is a heavy soil rather difficult to farm and is not well drained. It was formed from fine sediment deposited during periods of overflow. It commonly occupies low-lying, nearly level areas and is difficult to drain both because of its position and its heavy nature.

The surface soil is black with a drabbish cast. At a depth of about 10 inches the color becomes drab, and the material becomes sticky when wet and hard when dry. Lime concretions commonly occur at a depth of about 30 inches. This type, as it is mapped in Calhoun county, is very different from the same-named type mapped elsewhere in the state in that the top layer of black soil is much shallower and thruout the profile the color is more drab. Attention is called to these characteristics because they are associated with a relatively low agricultural value.

Management.—The topographic position of Deep Black Clay Loam, together with its fine texture, makes it somewhat difficult to farm. It has a tendency to work up cloddy and must be tilled with care to prevent poor physical condition. Sweet clover should be grown, if possible, as an aid in maintaining a good physical condition and as a source of nitrogen for the grain crops.

Black Clay (69)

Black Clay is a heavy soil occupying low areas only. It is an unimportant type because of its small total area. It has a black surface and is drab below 8 or 10 inches. Its heavy nature and its topographic position make drainage difficult. It is farmed in part and should be handled in the same way as Type 107, described above.

Drab Clay Loam (70)

Drab Clay Loam occurs in the Illinois bottom south of Hardin and also in a narrow strip just south of Star City in the Mississippi bottom. It differs from Type 107 in being lighter in color, which characteristic indicates a lower organic-matter content.

Management.—The management requirements of this type differ but little from those of Type 107. Particular attention should be given to keeping the supply of organic matter at least as high as it now is. The areas in timber should not be cleared; they are better suited to timber than to farming on account of the character of the soil and the frequency of overflow.

Drab Clay (71)

Drab Clay differs from Drab Clay Loam (70) chiefly in being heavier thruout the profile. It is farmed for the most part but is not a desirable soil, its fine texture making it difficult to work. It has a brownish drab surface and below about 8 inches it is drab or grayish drab.

Management.—This soil differs but little from Type 107 in management requirements. Regular additions of organic matter are probably of more importance with it than with Type 107 because of its heavier nature and because it has a lower organic-matter content.

Brown Mixed Loam (73)

Brown Mixed Loam is probably the best general farming soil in Calhoun county and occupies a total area of a little over 22 square miles. It lies above overflow. This type was developed from loess material washed down from the adjacent uplands by the small creeks and deposited along the bluffs in the Illinois and Mississippi bottoms.

This material has been deposited so recently that little subsurface or subsoil development has taken place. The surface 6 or 8 inches is light brown in color and the texture varies somewhat depending on the rate of flow of the creek that deposited it. The material below the surface 6 or 8 inches becomes lighter in color. At a depth of about 16 or 18 inches a slight increase in compaction and plasticity can be noted, indicating that this soil is in a very youthful stage of development.

Management.—Brown Mixed Loam is an excellent soil, and if provision is made for returning leguminous organic matter at regular intervals it will maintain a high state of productivity. Many areas of this type will grow alfalfa and sweet clover without the application of limestone, altho before seeding either of these crops tests should be made to determine whether any limestone is needed and if so, how much. Plants root deeply in this soil because of its permeability, and thus have a wider feeding range than where there is an impervious subsoil. Because of the deep-rooting habits of plants on this soil it is unlikely that sufficient increase in crop yields would be secured from phosphate or potash fertilizers to justify their use. The first thing to do is to meet the nitrogen deficiency by the use of legumes, tho it may be necessary in some areas to apply limestone before planting legumes. Following this, mineral fertilizers may be tried to see whether they can be used at a profit.

Mixed Sandy Loam (74)

Mixed Sandy Loam is of the same origin and has the same characteristics as Brown Mixed Loam (73) described above except that it has a coarser texture.

Its relative coarseness is explained by the fact that the material comprizing this soil was deposited in rapidly flowing water and the finer sediment was thus carried away. The largest area of this type occurs along Mississippi river near Star City.

Management.—Mixed Sandy Loam, if farmed, should be treated in the same way as Brown Mixed Loam. It is not so good a soil as Brown Mixed Loam but where overflow does not render it unfit for farming it may by good management be made to produce good crops.

Deep Brown Silt Loam (77)

Deep Brown Silt Loam occupies a total of about 19 square miles in Calhoun county. Altho horizon development is not very pronounced, because of the youthfulness of this type, the following characteristics can be distinguished: a brown or light brown surface soil, a grayish brown subsurface which begins at a depth of 8 or 10 inches, and a somewhat grayer subsoil which contains many black iron spots and soft iron concretions. Attention should be called to the fact that this type as it occurs in Calhoun county is not so deep and is of a grayer color than it is in the small bottoms in central and northern Illinois.

Management.—Deep Brown Silt Loam for the most part is farmed. It produces satisfactory crops, but much of it is subject to overflow during periods of high water. Because of its frequent overflow, which results in sediment being deposited in some places and a part of the soil being washed away in others, it is a question whether it would be worth while to apply any fertilizer treatment on this soil.

Mixed Loam (Overflow) (142)

Because it is so frequently overflowed, Mixed Loam (Overflow) is not of agricultural interest. It is occupied by timber, and no attempt should be made to use it for any other purpose as it will undoubtedly bring better returns in timber than if cleared and farmed when not under water.

CHEMICAL COMPOSITION OF CALHOUN COUNTY SOILS

In the Illinois soil survey the soil types are sampled in the manner described below and subjected to chemical analysis in order to obtain knowledge of the important plant-food elements. Samples are taken, usually in sets of three, to represent different strata in the top 40 inches of soil, namely:

1. An upper stratum extending from the surface to a depth of 6⅔ inches. This stratum, over the surface of an acre of the common kinds of soil, includes approximately 2 million pounds of dry soil.
2. A middle stratum extending from 6⅔ to 20 inches, and including approximately 4 million pounds of dry soil to the acre.
3. A lower stratum extending from 20 to 40 inches, and including approximately 6 million pounds of dry soil to the acre.

By this system of sampling three zones for plant feeding are represented separately. It is in the upper, or surface layer, that the farmer is more particularly interested, for it includes the soil that is ordinarily turned with the plow and is the part with which the farm manure, limestone, phosphate, or other

fertilizing material is incorporated. Furthermore it is the only stratum whose composition can be greatly changed by adding plant-food materials.

For convenience in making application of the chemical analyses, the results presented in Table 2 are given in terms of pounds per acre. It is a simple matter to convert these figures to a percentage basis in case one desires to consider the information in that form. In comparing the composition of the different strata, it must be kept in mind that different quantities of soil are represented, as indicated above. The figures for the middle and lower strata must therefore be

TABLE 2.—CHEMICAL COMPOSITION OF BROWNISH YELLOW-GRAY SILT LOAM, CALHOUN COUNTY, ILLINOIS

Average pounds per acre in 2, 4, and 6 million pounds of dry soil for the three sampling strata respectively

Stratum	Depth in inches	Total organic carbon	Total nitrogen	Total phosphorus	Total potassium	Total magnesium	Total calcium
Upper	0–6⅔	20 470	1 990	1 120	32 850	4 070	7 950
Middle	6⅔–20	14 160	1 670	2 440	72 310	11 060	16 990
Lower	20–40	13 050	1 960	4 270	108 410	25 770	32 340

divided by two and three respectively before being compared with each other or with the figures for the upper stratum.

No attempt is made in this report to determine the chemical composition of the bottom-land soils for two reasons. In the first place, some of them have been found to vary so greatly in character, even within very small areas, that average analyses would have but little application to any particular piece of land. In the second place, many bottom lands are subject to overflow, with the result that the soil is constantly changing; hence the chemical composition of a given area determined one year might bear no relation to its composition another year. No analyses are made of soils which, because of being rough hill land or for other reasons, are untillable.

It so happens that in Calhoun county all of the upland tillable soil has been found to be of the same type, namely, Brownish Yellow-Gray Silt Loam. Three samples of this type were secured from different parts of the county and found to agree very closely with each other in their chemical composition. The average chemical composition is given in Table 2.

The soil of this county presents one peculiarity in its chemical make-up which sets it off to some extent from the soils of other Illinois counties that have been studied; namely, a very high phosphorus content in the subsoil layers. The total phosphorus content averages 4,270 pounds an acre in the lowest sampling stratum and 2,440 pounds in the second stratum. The surface soil contains the usual quantity of phosphorus as compared with other soils in this part of the state.

The other soil constituents with which we are concerned in this study do not exhibit marked deviations from the usual. The organic carbon is found to be fairly low and it decreases rapidly with depth. Organic carbon, which is used as a measure or organic matter, amounts to 20,470 pounds. Since organic carbon

constitutes about half the organic matter, it may be computed that in the 2 million pounds of surface soil in an acre there is about 2 percent of organic matter. In the second stratum the organic matter content is reduced to .7 percent and in the lower stratum to .44 percent.

Nitrogen is always associated with the organic matter of soils. In the surface stratum the quantity is usually about one-tenth that of the organic carbon, as is the case in Calhoun county. It is not removed so rapidly as the carbon, however, by the decay of the organic matter, and as a result the proportion of nitrogen to carbon is greater in the older organic matter of the deeper layers. Thus the ratio of nitrogen to carbon increases from 1:10.3 in the surface soil to 1:8.5 in the second stratum and to 1:6.7 in the lower stratum.

The other three elements concerned, potassium, calcium, and magnesium, are present in this type in Calhoun county in amounts frequently found in upland silt loams. Calcium and, to a less degree, magnesium are related to the acidity of the soil. Determinations of acidity, as hydrogen-ion concentration (not recorded in the table), show a medium degree of acidity in the surface soil and a rapidly increasing acidity with increasing depth down to about 30 inches, after which there is a gradual diminishing of acidity. These results indicate that in general somewhat more limestone is needed on this soil type as it occurs in Calhoun county than one would ordinarily interpret as being necessary on the basis of the detailed acidity tests in any given field. In the sample from the south end of the county the degree of acidity thruout the profile was considerably less than in the other two samples studied.

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