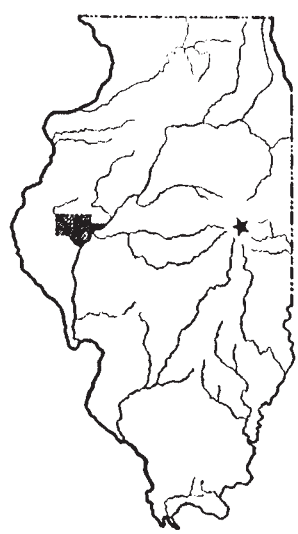
UNIVERSITY OF ILLINOIS
Agricultural Experiment Station

SOIL REPORT No. 56

SCHUYLER COUNTY SOILS

BY E. A. NORTON, R. S. SMITH, E. E. DeTURK, F. C. BAUER, AND L. H. SMITH



URBANA, ILLINOIS, MARCH, 1934

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

CYRIL G. HOPKINS

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

J. G. MOSIER

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 maintenance and improvement of our agricultural soils this knowledge is likewise necessary.

It is the purpose of a soil survey to classify the various kinds of soil of a given area in such a manner as to permit definite characterization for description and for mapping. With the information that such a survey affords, every farmer or landowner of the surveyed area has at hand the basis for a rational system of improvement of his land. At the same time the Experiment Station is furnished an inventory of the soils of the state, upon which intelligently to base plans for those fundamental investigations so necessary for solving the problems of practical soil improvement.

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

While the authors must assume the responsibility for the presentation of this report, it should be understood that the material for it represents the contribution of a considerable number of the present and former members of the Agronomy Department working in their respective lines of soil mapping, soil analysis, and experiment field investigation. In this connection special recognition is due Mr. O. I. Ellis, who, as leader of the field party, was in direct charge of the preliminary mapping of this county.

CONTENTS

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GEOGRAPHICAL FEATURES OF SCHUYLER COUNTY

SCHUYLER COUNTY is located in the western part of Illinois on the west bank of Illinois river. It is an irregularly shaped county, being almost twice as long as it is wide. It occupies an area of 426.64 square miles, or 273,050 acres. Rushville is the principal town and the county seat.

Much of the land surface is better adapted to permanent pasture than to the production of cultivated crops because it is so rolling as to be subject to serious erosion. This fact, together with lack of adequate grain-marketing facilities, has led to a predominance of livestock farming in the county. Most of the grain produced is fed to livestock because the railroads are so located as to necessitate long hauls to market from most parts of the county. Moreover the steepness

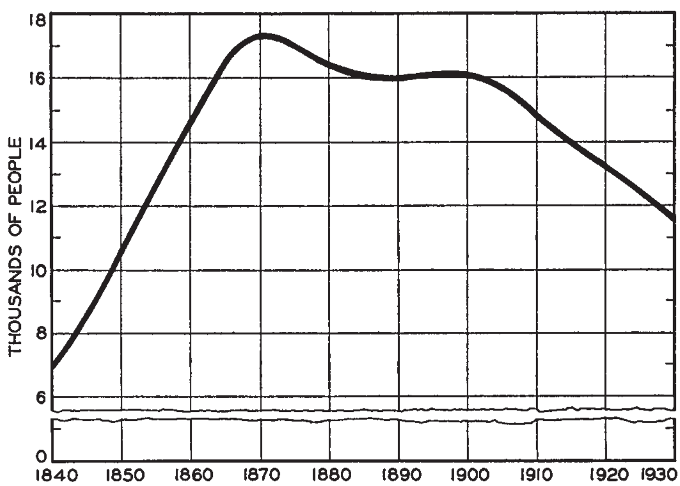

FIG. 1.—GROWTH OF POPULATION IN SCHUYLER COUNTY

The population of Schuyler county increased rapidly between 1840 and about 1870, reaching its peak in 1870. Since 1870 the number of inhabitants has steadily declined.

of the slopes and the poor condition of the roads in the rougher areas make transportation of heavy loads almost impossible in wet weather. Recently completed state concrete highways have improved local transportation facilities materially. Some of the grain grown in the Illinois bottom is shipped by boat on Illinois river.

The pioneer settler in the region was Calvin Hobart, who located near what is now the town of Rushville in the spring of 1823. The county was established in 1825, being formed from part of what was originally Pike county. It was named in honor of General Schuyler of Revolutionary fame. The Indians were

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driven out of the region about 1830. The population of the county grew rapidly after its founding until 1870, when the maximum number of 17,394 inhabitants was reached, according to the U. S. Census. Since that date there has been a slow but steady decline, as is shown in Fig. 1.

Agricultural Production

The rolling, well-drained land surface in Schuyler county favored a rapid early development in agriculture. By 1880 more than half the total area of the county had been improved for farming. Artificial drainage of the nearly level prairies and the construction of a levee along Illinois river brought all the land under cultivation except the rolling and rough areas along the streams. These lands have either been left in timber or have been kept in permanent grass.

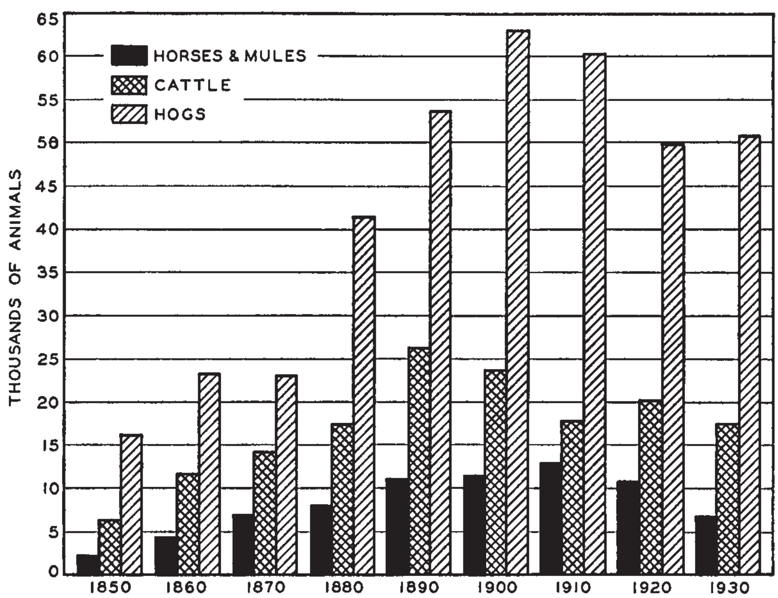

FIG. 2.—PRODUCTION OF PRINCIPAL CLASSES OF LIVESTOCK IN SCHUYLER COUNTY

The diagram shows the relative numbers of horses and mules, cattle, and hogs in Schuyler county in the Census years since 1850. (Figures from U. S. Census.)

Tenantry began to increase about 1880, and for the past thirty years about 40 percent of the farms have been operated by tenants.

From the beginning the rearing of livestock has been an important part of the agriculture in Schuyler county (Fig. 2). The number of animals on farms reached a maximum about the year 1900. In 1930 there were only about 70 percent of this maximum number in the county. The number of horses and mules especially has shown a decided decrease, there being only about half as many in 1930 as in 1910. The total value of all farm animals in 1931, as reported in Illinois Crop and Livestock Statistics, was $1,465,500. Somewhat less than half of this amount represented the value of all cattle, while the bulk of the remainder was divided almost equally between hogs and horses.

Corn has been the principal grain crop grown in Schuyler county, prior to 1910 the corn acreage exceeding that of all other crops almost every year. Since 1910 the corn acreage has averaged about two-fifths of the total crop acreage. Wheat has been, next to corn, the most important crop. The wheat acreage in 1920 almost equalled that of corn, but this situation was only temporary, being due to the demand for wheat brought on by the World War. The acreage devoted to hay and forage follows wheat in importance. It is interesting to note that the acreage of oats has varied little during the past twenty years. The average acre-yields for Schuyler county were 36.4 bushels of corn, 16.6 bushels of winter wheat, 30.8 bushels of oats, and 1.45 tons of tame hay for the ten-year period 1921 to 1930, according to figures published by the Illinois Crop Reporting Service.

Other field crops that have been given more or less attention in recent years are alfalfa, sweet clover, and soybeans. About 10,000 acres were devoted to these leguminous crops in 1930. Fruit and vegetable crops are of little commercial importance in Schuyler county.

Climate

The climate of Schuyler county is characterized by a wide range between the extreme temperatures of summer and winter and by an abundant rainfall. The highest temperature recorded at Rushville from 1902 to 1932 was 107° F. in 1918 and again in 1930; the lowest, 22° below zero, was recorded in 1924.

The average date of the last killing frost in spring during the 1902-1932 period was April 24; the earliest in the fall, October 23, giving an average growing season of 182 days. The shortest growing season recorded was 138 days in 1925, and the longest 206 days in 1921. The growing season is usually long enough to mature the common crops grown in the region, but occasionally, when the spring is wet and planting delayed, early frosts produce soft corn.

The average yearly rainfall for the thirteen-year period 1919-1931 was 36.27 inches; this includes the water melted from an average yearly snowfall of about 22 inches. The average rainfall during the growing season, April thru September, for the above mentioned period was 23.39 inches. Altho the total amount of rainfall is sufficient and the distribution fairly good, nevertheless a rainless period long enough to be harmful to growing crops occurs about one year out of three. Rainless periods of 10 to 20 days duration occur nearly every year, but unless they are preceded by adverse moisture conditions their effect on crop growth is not serious. There are, however, a number of considerations other than amount and distribution of rainfall to be taken into account in connection with moisture conditions for crop growth. Among these are (1) atmospheric conditions with respect to temperature and evaporation; (2) the capacity of the soil to absorb and retain moisture; and (3) the growth-stage of the crop and the reaction of the crop to drouth.

Physiography and Drainage

Head-water erosion has dissected the land surface of Schuyler county, producing, as a characteristic feature of the topography, narrow, flat areas, or tabular divides, lying between steep-sided V-shaped valleys. The land surface formerly was nearly level, with the exception of local, gently rolling areas in the western part of the county, where the drift deposit, explained below, was too thin to completely hide the preglacial relief. At present, however, about one-third of the area varies from very rolling to rough. The bottom lands along the small streams are narrow, and the slopes leading from them to the upland are too steep to be cultivated. Such a situation is depicted in Fig. 3.

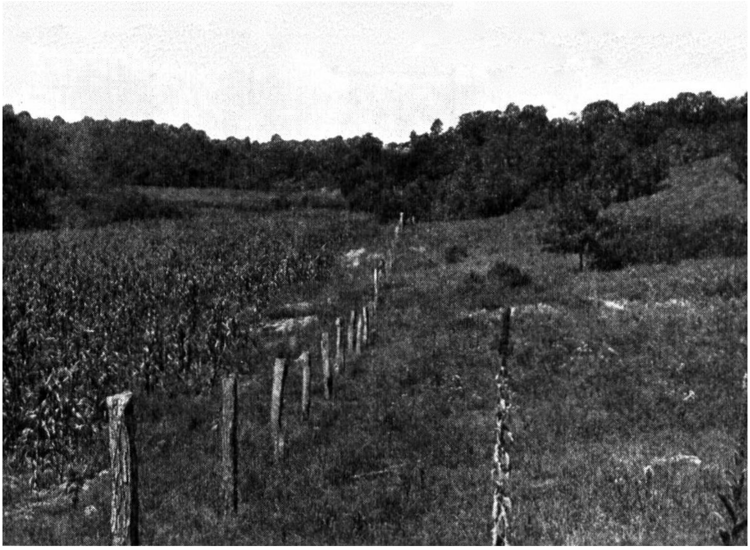

FIG. 3.—CHARACTERISTIC TOPOGRAPHY ALONG A SMALLER RIVER BOTTOM IN SCHUYLER COUNTY

A long, narrow strip of bottom land is shown lying between steep slopes leading to the upland. These slopes are too steep to be cultivated, and must be left in pasture and woods. A large part of Schuyler county is cut up by such valleys as this.

The upland lies between 600 and 700 feet above sea level and about 150 to 200 feet above the level of Illinois river. The altitude of Rushville is 669 feet above sea level; that of Frederick 451 feet.

The county on the whole is well drained, as shown by the accompanying drainage map (Fig. 4). The streams have cut back until only narrow remnants of the original flat table-land remain. Natural drainage in the rolling upland is so well developed that rapid run-off results in serious erosion. The nearly level prairie land in the north-central part of the county has been artificially drained by tiling. Since the prairie land in the western part of the county does not drain easily with tile, surface ditches are employed to help remove the excess water. Small areas underlain by an almost impervious subsoil exist on the narrow divides. These areas are poorly drained, but their small size makes it possible to remove the excess water by furrows or open ditches leading to the heads of natural drainage channels. The bottom land of Crooked creek is subject to overflow during heavy and continued rainy periods.

A large part of the Illinois river bottom land that is protected by levee from overflow does not flood except during the highest flood stages. Tile and open ditches carry the excess water to a central point where it is pumped out of the leveed districts.

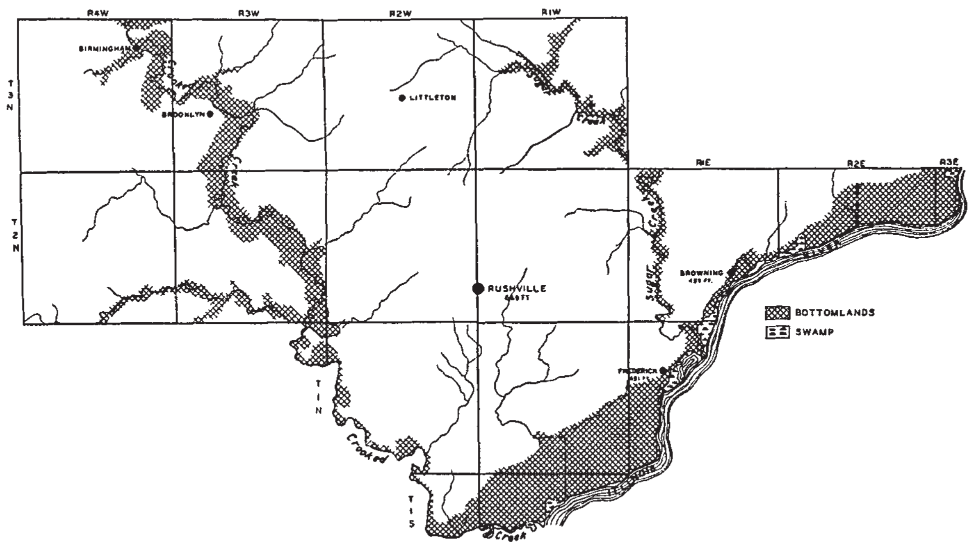

FIG. 4.—DRAINAGE MAP OF SCHUYLER COUNTY

The natural drainage courses are shown by the stream channels. Bottom land and swamp areas are also indicated. The altitude at certain points in the county is shown by the figures which express height in feet above sea level.

FORMATION OF SCHUYLER COUNTY SOILS

Origin of Soil Material

The soil material from which the upland soils of Schuyler county were developed was deposited during the Glacial epoch, and the present topography is largely the result of glacial action and subsequent erosion. The bottom-land soils have been developed from material more recently deposited as alluvium by streams overloaded with sediment.

The climate during this Glacial period was colder than at present. Snow and ice collected in vast amounts in the northern regions of the continent until the pressure was so great that vast masses pushed outward from these centers. This ice advanced chiefly southward, aided by accumulations of snow and ice at the margin, until a region was reached where the climate was warm enough to melt the ice as rapidly as it advanced. In moving across the country from the far north, the ice 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 against each other until largely ground into powder. The great bulk of material carried, however, was derived from the old bed-rock surface and deposited within a few miles of its origin. Under the enormous pressure of the ice, hills were leveled off and valleys filled in. The melting of the glaciers left a mixture of mineral materials, known as till or drift, scattered over the areas which they had occupied.

There were several periods during which ice sheets moved down from the north. The movements were separated by long intervals of time during which the climte became warm and the country was again clothed with vegetation. At least two of the glaciers entered Schuyler county, the last one, the Illinoian, completely covering it, burying or destroying the deposits left by an earlier invasion. The deposition of material by the Illinoian ice accounts for the smoothness of the topography of the county prior to the cutting back of the present drainage channels.

Associated with the oncoming and withdrawal of each ice sheet, and the exposure of the deposited material to weathering forces, was the accumulation of a silty, wind-blown material known as loess. This material was derived largely from the sediment deposited from the immense volumes of water which flowed from the melting ice sheet. This water filled the drainage channels and overflowed adjacent lowlands. Following each flood stage, the water would recede and the sediment which had been deposited would dry and be picked up by the wind and blown over and redeposited on the upland as dust. Undoubtedly some fine material was left on the surface by the receding ice and more accumulated as weathering broke down the larger particles. This material was also blown about when dry, and it, together with that from the lowlands, collected as a blanket on the upland. Most of the loess deposited in Schuyler county came from the Illinois river valley, as is indicated by a thinning out of the material in all directions away from the bluff. The thickness of the loess varies from a minimum of about 5 feet in the western part of the county to a maximum of 50 or more feet on the Illinois river bluffs.

The loess deposited in Schuyler county was not all laid down during one period. Altho none of the ice sheets which followed the Illinoian actually touched Schuyler county, they furnished immense volumes of water to Illinois river and much sediment was deposited in its bottom land. This sediment was blown over the upland as loess. Two deposits probably occurred, separated by a relatively short interval of time. The age and thickness of loess deposits have a significant bearing on the development of the soils, as will be brought out later.

Soil Development

As soon as the soil material was deposited, soil-forming forces became active and began to change the original material into soil. When first deposited, the loess was of an open, porous nature, high in carbonates and well supplied with the mineral elements of plant food. As time went on, weathering forces began to leave their imprint on the soil material, producing under different conditions soils of widely different characteristics. Some of the conditions responsible for these variations in soil characteristics were slope of land, amount of moisture present, and the character of the vegetation. As the weathering action continued, the differences that thus developed in the soil material became more and more pronounced, until finally soil "individuals" or soil types were evolved.

Early in the history of the weathering of the soil material, plant seeds were distributed over the land by natural agencies, and vegetation began to spread from its first centers. The simpler forms of vegetation came first, followed by the higher plants as rapid chemical decomposition made an abundance of plant food available. At first conditions were more favorable for the development of a grass vegetation; but as streams were extended and drainage improved, forests began to encroach on the prairie. In Schuyler county the forest advanced over the prairie until only narrow remnants of the original prairie remain. The grass vegetation, with its enormous quantity of surface roots and the high lime and moisture content of the soil material resulted in an accumulation of organic matter and the development of a dark-colored surface soil. Timber vegetation, unlike grass vegetation, contributes little organic matter to the soil, and consequently the soils of areas occupied by forests for a long time are light colored.

The changes which took place in the development of soil from the original raw material were exceedingly complex and cannot be fully described in the

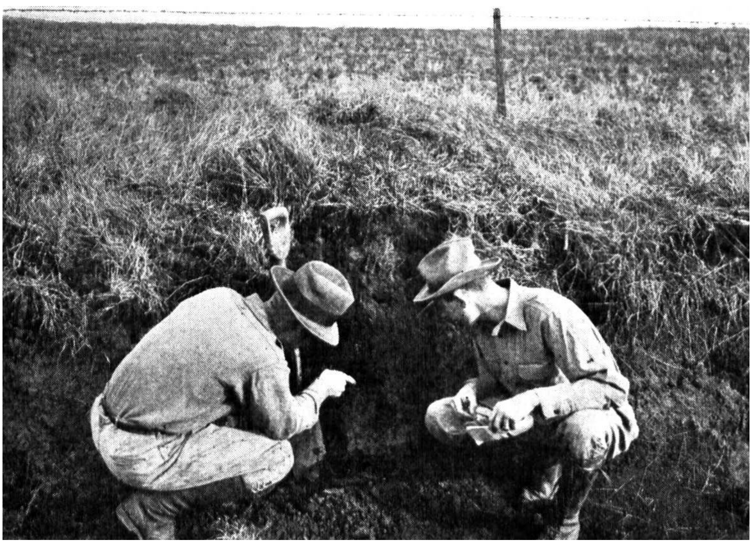

FIG. 5.—STUDYING THE SOIL PROFILE

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."

space available in this report. Some of the important changes were brought about by freezing and thawing, wetting and drying, and other weathering processes. These processes were instrumental in breaking down the complex minerals; in dissolving and leaching the more or less soluble constituents of the soil material, including limestone; and in the movement and, under conditions of slow drainage, in the accumulation of very fine particles in the subsoil. The breaking down of complex minerals freed elements of plant food and made them available to growing plants. Solution and leaching started soil impoverishment and developed soil acidity. The accumulation of very fine particles in the subsoil under slow drainage resulted in the formation of an impervious layer.

The soils in the western part of Schuyler county are older, more acid, and less productive than those in the eastern part. There are two principal reasons for this condition. The loess deposits on the western side of the county are somewhat older than those nearer the river and they are therefore more thoroly leached than the younger deposits. The deposits on the western side are also thinner, and thin deposits are subject to a more rapid rate of weathering than are thick deposits.

One of the most pronounced and universal effects of the weathering of soil material is the production of layers, or zones, in the soil, each zone having more or less definite characteristics. From a practical standpoint these various zones can be grouped into surface, subsurface, and subsoil. Differences in the arrangement, thickness, and nature of the features of the respective zones constitute the basis upon which soil types are separated.

Soil Classification and Mapping

In the soil survey the soil type is the unit of classification. 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 type descriptions which follow are intended to give the reader a fairly clear idea of the characteristics of each soil and to be of assistance in planning efficient use and management practices.

Failure to appreciate the fact that soil types are differentiated on the basis of the character of the entire soil section, and not of the surface alone, often makes it difficult to understand what is meant by "soil type." It frequently 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 agricultural value. It is of the utmost importance, therefore, in studying descriptions of soil types to note carefully the outstanding features of the entire soil section.

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

Type No.	Type name	Area in square miles	Area in acres	Percent of total area
5	Eroded Silt Loam	137.41	87 942	32.21
16	Rushville silt loam	2.57	1 645	.60
18	Clinton silt loam	140.95	90 208	33.03
41	Muscatine silt loam	21.88	14 003	5.13
43	Grundy silt loam	10.65	6 816	2.50
46	Edina silt loam	3.67	2 349	.86
65	Grundy clay loam	2.39	1 530	.56
73	Huntsville silt loam (bottom)	50.03	32 019	11.73
81	Littleton silt loam (terrace)	1.62	1 036	.38
87	Sumner sandy loam (terrace)	2.03	1 299	.47
107	Swan clay loam (bottom)	9.18	5 875	2.15
127	Harrison silt loam	20.16	12 902	4.73
128	Douglas silt loam	5.39	3 450	1.26
134	Camden silt loam (terrace)	4.60	2 944	1.08
136	Brooklyn silt loam (terrace)	1.29	826	.30
137	Ellison silt loam (terrace)	.47	301	.11
139	Hersman silt loam (terrace)	.08	51	.02
140	Browning silt loam (terrace)	9.09	5 818	2.13
	Miscellaneous			
	Water	1.02	653	.24
	Swamp	2.16	1 382	.51
	Total	426.64	273 050	100.00

The accompanying soil map, shown in two parts, gives the location and boundary of each soil type found in Schuyler county, and indicates the position of streams, roads, railroads and towns. Table 1 gives the list of soil types, 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

The soils of Schuyler county have been differentiated into eighteen soil types based on the principles explained above. A brief description of the outstanding characteristics of each type, together with general recommendations for its use, care, and management, are given in the following pages a summary of which will be found in Table 2, page 14.

In the following recommendations frequent reference is made to Circular 346, "Test Your Soil for Acidity," and Circular 421, "Testing Soil for Available Phosphorus." These and other publications may be obtained free of charge by addressing the Experiment Station.

Eroded Silt Loam (5)

Eroded Silt Loam is one of the most extensive soil types in Schuyler county, covering a total of 137.44 square miles, or about one-third of the area of the county. It occupies the very rolling and rough areas between the stream bottom lands and the level uplands and is in large part unsuited to cultivation because of the steepness of the slopes. It has no well developed soil characteristics because of varying rates of erosion to which it is subject, and it can hardly be considered a true soil type. Near the Illinois river bottom land, erosion has exposed the unleached loess in many places. In the central and western parts of the county the sandy, gravelly glacial drift is exposed on the lower slopes, and in a few places along the western branches of Crooked creek rock outcrops occur.

Use and Management.—Eroded Silt Loam is adapted mainly to pasture and timber because under cultivation it is subject to disastrous erosion. Some of the more moderately sloping land along the Illinois river bluff can be seeded to sweet clover or to alfalfa to serve as a legume pasture. Those areas now in timber should remain in timber, and most of the cleared areas should be replanted with trees. The soil will grow marketable timber satisfactorily if fires are controlled and no attempt is made to pasture the land (Figs. 6 and 7). Information about reforestation may be obtained from the Agricultural Experiment Station.

Considerable effort has been expended during the present season in the improvement of this type of land thru the activities of one of the government Civilian Conservation Corps camps located at Rushville. This work has consisted largely of putting the water courses into condition to carry off the excess water effectively without causing further washing of the land.

Rushville silt loam (16)

Rushville silt loam occurs in small patches on the nearly level remnants of the tabular divides between the small streams. It occupies only about 2½ square miles. It is a light-colored soil and has poor underdrainage.

FIG. 6.—A BIT OF SCHUYLER COUNTY FOREST ON LAND SUBJECT TO EROSION

This thrifty stand of oak growing on Eroded Silt Loam indicates the possibilities of this soil for timber production and suggests one method for preserving the 28,000 acres of this type in Schuyler county from destructive erosion. Fig. 7 shows what happens to this soil when the timber is removed.

FIG. 7.—A CHARACTERISTIC VIEW OF ERODED SILT LOAM IN SCHUYLER COUNTY

Much of the Eroded Silt Loam of Schuyler county is in the same condition as this hillside pasture. With the timber removed, gullies are being washed out, and a scrubby growth of trees and brush are the only suggestion of the once vigorous timber that flourished here. Compare this scene with that of Fig. 6, where on the same soil type an oak forest has been allowed to develop.

The surface soil is a brownish gray silt loam which runs together and packs easily during rains. Hard, rounded, black pellets are found on the surface and thru the soil. These pellets are indicative of poor underdrainage. The subsurface layer begins at 6 to 7 inches and is a gray, somewhat ashy, silt loam. The subsoil occurs at 18 to 21 inches and continues with little change down to 33 to 36 inches. It is compact and plastic and does not permit ready water movement. When dry, it breaks up into angular blocks which are heavily gray-coated; the interior of the blocks is brownish yellow. The material below the subsoil is friable and reddish yellow in color.

Use and Management.—The nearly level topography and relatively impervious subsoil of Rushville silt loam make drainage difficult. Tile will not draw satisfactorily. The occurrence of this type in small areas located not far from the

FIG. 8.—ONE METHOD OF CHECKING EROSION DAMAGE

A retaining wall of boughs and brush is built along the sides of a ditch in places subject to washing out by rapidly running water. Members of the Civilian Conservation Corps are shown at work on this job.

heads of gullies makes it possible, however, to remove much of the surface water by furrows and shallow ditches leading into natural drainage outlets. The soil is strongly acid and low in nitrogen and organic matter. Manure will provide both of these constituents, as will also sweet clover or other legumes when plowed under. Sweet clover will grow on this soil if the acidity is corrected; but if it is to be seeded, the field should first be tested for soil acidity, as explained in Circular 346, "Test Your Soil for Acidity," and limestone applied in such amount as the test indicates is necessary. This soil is better adapted to the growing of grass for hay or pasture and for small grains than for corn, altho when properly managed and treated it will produce satisfactory corn yields except in climatically unfavorable years.

Clinton silt loam (18)

Clinton silt loam is the most extensive soil type in Schuyler county, occupying 140.95 square miles, which is one-third of the total area of the county. It is a

TABLE 2.—SCHUYLER COUNTY SOILS: CHARACTERISTICS, PROPERTIES, AND RECOMMENDED UTILIZATION

Type No.	Type name	Drainage		Organic matter	Reaction	Available phosphorus	Utilization		
		Surface	Under				Crop land[1]	Permanent pasture[2]	Forest[2]
5	Eroded Silt Loam	Very rapid	Rapid	Low	Variable	Variable	10	C	B
16	Rushville silt loam	Slow	Very slow	Low	Acid	Low	8	B	B
18	Clinton silt loam	Rapid	Moderate	Low	Acid	Low	5	A	A
41	Muscatine silt loam	Rapid	Moderate	Medium	Medium acid	Low	2	....	....
43	Grundy silt loam	Moderate	Moderate	High	Slightly acid	Medium low	1	....	....
46	Edina silt loam	Slow	Slow	Medium	Acid	Low	5	A	A
65	Grundy clay loam	Slow	Moderate	High	Neutral	Medium	1	....	....
73	Huntsville silt loam (bottom)	Rapid	Rapid	Medium	Neutral	Variable	4	A	A
81	Littleton silt loam (terrace)	Rapid	Moderate	Medium	Medium acid	Medium low	3	....	....
87	Sumner sandy loam (terrace)	Rapid	Rapid	Low	Medium acid	Variable	7	B	A
107	Swan clay loam (bottom)	Slow	Slow	Medium	Neutral	Medium	6	A	A
127	Harrison silt loam	Moderate	Slow	Medium	Acid	Low	5	A	A
128	Douglas silt loam	Rapid	Moderate	Medium	Acid	Low	6	A	A
134	Camden silt loam (terrace)	Rapid	Moderate	Low	Acid	Low	5	A	A
136	Brooklyn silt loam (terrace)	Slow	Slow	Medium	Acid	Low	8	B	B
137	Ellison silt loam (terrace)	Rapid	Rapid	Low	Acid	Low	9	B	B
139	Hersman silt loam (terrace)	Slow	Slow	Medium	Slightly acid	Medium low	4	....	....
140	Browning silt loam (terrace)	Rapid	Moderate	Low	Neutral	Variable	3	....	....

[1]Numbers are used in this column to indicate the inherent power of these types to produce the major crops grown in the region without soil treatment. The scale is 1 to 10, 1 indicating that the soil ranks with the most productive in the state for grain crops, and 10 that it ranks with the least productive.

[2]The letters used in these two columns indicate the inherent producing power of the soil were the land utilized as permanent pasture or as forest. The scale used is A to C, A indicating that the type ranks with the best in the state for the purpose, and C that it ranks with the poorest.

light-colored soil and has developed under moderately rapid drainage. It occurs on sloping land, and much of it lies in narrow, irregularly shaped areas between areas of rough land along streams. This type in the western part of the county is somewhat less productive than that found in the eastern part because of being more mature and therefore more thoroly leached.

The surface soil is a friable, brownish yellow silt loam extending to a depth of 6 to 7 inches. The silt is coarser near the Illinois river bluffs than in the western part of the county. The subsurface is distinctly yellowish. The subsoil begins at 14 to 18 inches and is a medium-compact and somewhat plastic silty clay loam. It breaks into subangular particles which are coated a pale yellowish gray. The interior of these particles is yellow splotched with reddish brown. Below 28 to 36 inches the material becomes friable.

Use and Management.—The gently rolling slopes and the permeable subsoil make the natural drainage of Clinton silt loam satisfactory in all but the more nearly level areas. Tile can be used to advantage in these spots. The portion of this type lying adjacent to the heads of gullies and on long slopes is subject to erosion thru run-off water, and if cultivated should be so handled as to decrease the amount of erosion. A well-rounded and effective erosion program may involve any one or all of the following practices: use of sodded draws, construction of dams of various types including sod bag dams, terracing, contour farming, and strip cropping. It is advisable to keep slopes greater than 6 percent in permanent grass rather than in cultivated crops.

The soil is acid and also low in organic matter. Red clover can be grown without the use of limestone in favorable years on that portion of the type near the Illinois river bluff, but failures are frequent and, before clovers are seeded, the soil should be tested for acidity, as explained in Circular 346, and limestone applied as indicated. Manure and clovers plowed under will increase the productivity of this soil. The probabilities are that a phosphate application would be profitable, particularly where alfalfa is to be seeded. It is advisable, however, to test for available phosphorus, as explained in Circular 421, before applying this material.

A crop rotation for improving and maintaining the producing capacity of this soil might include corn, small grains, and a legume plowed under at least every third year.

Muscatine silt loam (41)

Muscatine silt loam is a dark-colored soil found on gently rolling slopes mainly in the north-central part of the county. It occupies, all told, about 22 square miles.

The surface soil of this type is a friable silt loam varying from 7 to 9 inches in thickness. It is brown when dry and brownish black when moist. The subsurface is light brown in color and extends to a depth of about 18 inches. The subsoil is yellowish brown. The material breaks into small subangular fragments. It is medium-compact and slightly plastic. Below 32 to 34 inches the material becomes friable and is readily permeable to water.

Use and Management.—Muscatine silt loam is one of the best general-purpose soils in Schuyler county. It is adapted to the production of all grain crops grown in the region. It has moderate to rapid natural drainage. Tile will improve the underdrainage, being particularly effective in wet seasons. Erosion is a minor problem and may be controlled by good farming methods, including the building up of the organic-matter content.

Red clover will grow on this soil in favorable seasons unless the land has been farmed too intensively, but for the best yields limestone and phosphate should be added. The soil should be tested, as explained in Circulars 346 and 421 before applying either limestone or phosphate. Limestone must be applied for growing either sweet clover or alfalfa satisfactorily. Manure or other fresh organic materials should be returned to the soil and plowed under regularly to maintain the organic-matter supply.

The results of the Kewanee experiment field, a summary of which is given on pages 482 to 484 in Bulletin 362, may be taken as a guide for the treatment of this soil.

Grundy silt loam (43)

Grundy silt loam is a dark-colored soil occurring in conjunction with Muscatine silt loam, but may be distinguished from Muscatine by its more nearly level topography. It occupies about 10 square miles in Schuyler county. It is a highly productive soil.

FIG. 9.—ALFALFA ON GRUNDY SILT LOAM

This thrifty stand of alfalfa found in Schuyler county suggests the desirability of raising more of this valuable feeding crop on land adapted to its culture.

The surface soil is dark brown and 8 to 10 inches thick. The subsurface is darker and of somewhat heavier texture than the surface. The subsoil lies at a depth of 18 to 20 inches. It is slightly compact and medium-plastic, breaking into angular black-coated fragments. At 33 to 36 inches the material is very friable and of a drabbish yellow color splotched with reddish brown.

Use and Management.—Natural surface drainage of Grundy silt loam is slow because of its nearly level topographic position, but the structure of the subsoil is such as to allow ready water movement if an outlet is established. Tile will underdrain the soil very satisfactorily. The organic-matter content of this soil is relatively high, but this does not mean that regular additions of fresh organic materials are not necessary. Manure and legumes plowed under at least once in the rotation will supply the needed amount.

Red clover will grow on this soil nearly every year without the application of limestone. The indications are that a small application of phosphate will increase the clover and particularly the alfalfa yields. Before applying phosphate the soil should be tested, as indicated in Circular 421. If sweet clover or alfalfa are to be grown, the soil should be tested for acidity as well as for phosphorus, as indicated in Circular 346 and, if acid, limestone should be applied in the amounts shown by the test. Testing often affects considerable saving in the use of lime and fertilizer materials by showing what and how much material is needed, and in legume seed by showing which crops cannot be grown without the addition of a soil amendment as well as what amendment is needed in order to grow a particular legume.

In this connection the results of experiments on the Aledo field, in Mercer county, showing the effects of various fertilizer treatments and crop rotations on crop yields, will be of interest (see Bulletin 362, pages 476-480). This soil is adapted to grain cropping, and corn may well predominate in the rotation.

Edina silt loam (46)

Edina silt loam is a dark-colored soil and occurs in small patches in the western part of the county. It has a similar topographic position to that of Grundy silt loam, described above. The soil differs from Grundy, chiefly, in having a grayer surface, a less pervious subsoil, and in being somewhat less productive. It occupies only 3.67 square miles, which is less than 1 percent of the area of the county.

The surface soil is brown when moist but has a distinct grayish cast when dry. The subsurface is grayish brown and lighter in texture than the surface. The subsoil is a medium-compact and plastic clay loam. When dry it breaks into angular particles which are heavily coated with brownish drab silty material. Below 36 to 38 inches the material is friable and drabbish yellow in color.

Use and Management.—Tile must be employed to secure adequate drainage for this soil. They should be fairly large and the lines placed not over 3 to 4 rods apart. Organic matter should be provided for soil improvement by the frequent plowing under of animal manure or some leguminous crop. Red clover will make a stand without any soil treatment in favorable years, but the land should be tested for acidity and available phosphorus, as suggested in the management of Grundy silt loam, before legumes are seeded.

Edina silt loam will return satisfactory crop yields if properly treated and managed. Much more care is required in farming it, however, than is demanded on the dark-colored soils in the eastern part of the county. Altho the soils on the Carthage and Clayton experiment fields are not exactly like this soil as it occurs in Schuyler county, the results of experiments on these fields, an account of which is given in Bulletin 362, pages 488-491, will nevertheless be of interest in this connection.

Grundy clay loam (65)

Grundy clay loam occupies the low-lying depressions in the original prairie regions and occurs in conjunction with Grundy silt loam. It is a potentially productive soil and yields good crops consistently if properly underdrained. It is of minor importance in Schuyler county because of its limited extent.

This soil differs from Grundy silt loam (page 16) in being darker in color and heavier in texture thruout the surface and subsoil. The surface soil is granular, and even after many years of cultivation it breaks up into small particles when plowed, unless it is plowed when too wet.

Use and Management.—Grundy clay loam is particularly adapted to the growing of corn. The soil is not acid and will grow sweet clover without the addition of limestone. Fresh supplies of organic material, either manure or green-manuring crops, should be plowed under at intervals in order to avoid a poor physical condition; but the use of other fertilizing materials on this soil is not advised at present.

Huntsville silt loam (bottom) (73)

Huntsville silt loam (bottom) occurs in the small creek bottoms, in Crooked creek bottom, and in those areas in Illinois river bottom land where sediment from the adjacent upland is frequently deposited. It occupies about 50 square miles, but most of the area is so irregularly shaped and cut up by stream courses that it is difficult to utilize it for farming. The soil cannot be very definitely described because of the frequent changes that occur during periods of overflow. In general the soil is of a silty texture and varies from yellowish gray to brownish yellow in color.

Use and Management. — Altho this soil is subject to overflow, much of it drains readily and is usually dry long enough to produce a crop of corn or other crops that mature during the summer. No treatment is suggested because overflows frequently renew the soil material. The areas that lack drainage or that are inaccessible for cultivation are used either for pasture or kept in timber.

Littleton silt loam (terrace) (81)

Littleton silt loam (terrace) occurs on gently rolling land which lies from 3 to 18 feet above the first bottom along Crooked creek and Illinois river. It overflows only during the highest floods, and the water never remains on the land long. A stratum of sand and gravel underlies this soil at a depth of 50 or more inches, giving moderately rapid underdrainage. There is considerable variation in the character of this soil owing to differences in the texture and thickness of the material deposited. The surface soil is dark colored and varies from a heavy silt loam to a coarse silt. The subsoil is of a yellowish color and shows little development in its aging processes.

Use and Management.—The management recommended for this soil is similar to that suggested for its corresponding upland type, Muscatine silt loam, page 15. More emphasis, however, should be placed on the return of fresh organic material because this soil is more deficient in organic matter than is Muscatine silt loam. It is naturally well drained except for small, nearly level spots which can be tiled out. It is adapted to general grain crop production.

Sumner sandy loam (terrace) (87)

Sumner sandy loam (terrace) occurs on low ridges in Crooked creek and Illinois river bottom lands. These areas are old sand bars formed during former periods of high water. From the standpoint of the aging processes, the soil shows little development. It varies from a fine sandy loam to a sandy loam. Some gravel is scattered over the surface in a few places.

Use and Management.—Altho this soil is sandy it is not drouthy except during prolonged dry seasons. It can be used for the production of grain crops, vegetables, and melons. As organic matter and nitrogen are readily lost from the soil, frequent small additions of manure or other fresh organic materials are necessary. Limestone is required for the growth of legumes, but it should not be applied without first testing the soil for acidity, as directed in Circular 346.

Swan clay loam (bottom) (107)

Swan clay loam (bottom) occurs mostly along Illinois river. It was formerly swampy and subject to frequent overflow. Most of this land is now protected from overflow by levees and has been drained by tiling and dredging. This soil was formed from sediment deposited in quiet water and is therefore heavy-textured. The surface soil varies in color from drabbish brown to drabbish black and in texture from a silty clay loam to a clay. It cannot be worked when wet, and consequently during rainy seasons difficulty is experienced in preparing a seed bed. Below the surface the material becomes heavier in some places and at other places lighter in texture.

Use and Management.—This soil grows good corn when it is properly drained. Breaks in the levee and the failure of drainage districts have left some areas undrained in recent years. Frequent additions of fresh organic materials should be made in order to keep the soil in good physical condition. It will grow sweet clover without the application of lime.

Harrison silt loam (127)

Harrison silt loam is a dark-colored soil developed on the gently rolling prairie in the western part of the county. It occupies about 20 square miles, or nearly 5 percent of the total area of the county.

The surface soil is a friable silt loam about 8 inches thick. When moist it is brown but upon drying it has a gray cast owing to the presence of gray specks on the brown particles. The subsurface is yellowish brown, and like the surface, becomes decidedly grayish when dry. The subsoil begins at 15 to 18 inches and is a medium-compact and plastic drabbish yellow clay loam. Below 34 to 36 inches the material becomes friable.

Use and Management.—Better results are obtained on this soil if tile are used to improve the moisture conditions. The tile should not be placed more than 4 rods apart. The organic matter should be replenished by frequent additions of animal manure or leguminous crops plowed under. The soil is acid, and limestone should be added before red or sweet clover seed are sown, but the soil should first be tested to determine the amounts to add, as directed in Circular 346. If alfalfa is to be grown, an application of phosphate will probably be beneficial, altho it is advisable to test for available phosphorus, as explained in Circular 421, before applying phosphate. In addition to these preliminary treatments a trial application of some potassium fertilizer is suggested for corn. The results of experiments on the Clayton field, Adams county, described in Bulletin 362, pages 488-491, will be of interest in showing the increased yields obtained from various treatments on soil similar to this.

Douglas silt loam (128)

Douglas silt loam is a dark-colored soil developed on rolling prairie land. Most of it is to be found in Huntsville township. It occupies 5.39 square miles.

The surface soil is a shallow light brown silt loam. It has a gray cast when dry. The subsurface is brownish yellow, also with a distinctly gray cast when dry. The subsoil begins at 12 to 15 inches and is a slightly compacted, slightly plastic clay loam. Below 22 to 24 inches the material is friable. On the more rolling areas in Huntsville township, some sand and gravel are found in the subsoil. This is glacial drift material that lies close to the surface because much of the overlying silty loess has been removed by erosion.

Use and Management.—Under continual cultivation this soil is subject to serious sheet erosion. A crop rotation should be used which includes a predominance of grass crops, so that vegetation will be growing on the land in winter and early spring. The steeper slopes should be terraced if cultivated. The building of terraces is described in Circular 290. The soil is adapted to the growing of legumes, orchard and small fruits, and grain crops. Before seeding legumes, the soil should be tested for its need of limestone and available phosphorus. Frequent additions of manure or fresh organic materials added to the soil will help prevent erosion and also give a greater return in crop yields. This soil deteriorates rapidly under poor farming.

Camden silt loam (terrace) (134)

Camden silt loam (terrace) occurs on second bottom land along the larger creeks in the county. It overflows only during the highest flood stages and then the water soon drains away. It occupies a total of 4.6 square miles. This soil does not differ materially, except in origin, from Clinton silt loam (18) which is described on page 13 along with suggestions for its use and management.

Brooklyn silt loam (terrace) (136)

Brooklyn silt loam (terrace) occurs mostly in Camden township along Crooked creek and lies only a few feet above the first bottom. It drains slowly because of a compact and plastic subsoil. It has a grayish brown surface soil and a gray, somewhat ashy subsurface. Tiling and surface ditching are necessary to obtain rapid drainage. The soil is acid and low in organic matter. The organic matter can be built up in the same ways as suggested for Harrison silt loam, page 19. With good farming, and after the drainage has been improved, this soil will produce moderate yields of common grains, but it cannot be expected to produce so abundantly as the dark-colored soils of the upland.

Ellison silt loam (terrace) (137)

Ellison silt loam (terrace) occurs in Illinois river bottom land to the southwest of Bluff City. It is similar to Camden silt loam (134) except that the surface soil is somewhat sandy and sand and gravel occur within 15 to 25 inches of the surface, making the soil drouthy. Only 300 acres of this type occur in Schuyler county.

Hersman silt loam (terrace) (139)

Two areas of Hersman silt loam (terrace) aggregating only 51 acres occur in Section 14 of Camden township. This soil differs from Brooklyn silt loam (terrace) (136) in having a darker and thicker surface soil and a more pervious subsoil. The same treatment suggested for Brooklyn silt loam (terrace), page 20, applied to this soil will give greater response.

Browning silt loam (terrace) (140)

Browning silt loam (terrace) is derived from sediment washed in from the adjoining bluffs or carried in by small streams. The thickness of the deposit varies from 6 inches to several feet. The material is of a coarse silty texture and varies in color from grayish to brownish yellow. It is too young to have a well-developed subsoil. The areas of this type are subject to frequent overflow and deposition, but as they slope away from the bluffs surplus water drains away rapidly and rarely is there damage to growing crops. This is a productive soil and is adapted to the growing of grain crops. Legumes can usually be grown without limestone being added, but it is advisable to test for acidity, as described in Circular 346, before seeding sweet clover or alfalfa.

CHEMICAL PROPERTIES OF SOIL TYPES OF SCHUYLER COUNTY

Samples of the principal soil types that occur in Schuyler county have been analysed for the total amounts of the more common plant-food elements. Only the data for the surface stratum are reported here. Data for corresponding subsurface and subsoil samples are on record and may be obtained on request.

These chemical determinations are presented in Table 3, in terms of pounds per acre as in 2 million pounds of dry soil. No analyses were made of the bottom-land types because of their changing character resulting from frequent overflow and the deposition of new soil material. Eroded Silt Loam, a rough hilly type, is another type for which no analysis is given because of its great variability.

Availability of Plant-Food Elements

In considering the chemical content of a soil one must bear in mind the fact that each of the various plant-food elements present exists in different chemical forms, or combinations, and that these different forms occur in varying proportions in different soils. Furthermore, under varying soil conditions, these forms differ in the rates at which they become available to growing crops. The major portion of an element is usually present in a comparatively insoluble form which plants are unable to assimilate, but thru the effects of weathering these materials gradually become partially soluble and thus are made available for plant growth.

The analyses reported in Table 3 represent the *total quantities,* and not the so-called available amounts, of the respective plant-food constituents in the soil. They indicate the maximum plant-food supply that could possibly be drawn upon and thus give some idea of future productivity under long-continued cultivation.

It is evident, for example, that a soil such as Type 16, containing as little as 1,620 pounds of nitrogen and 870 pounds of phosphorus per acre, cannot survive many years of cropping unless these essential elements are replenished. Whether such fertilization will prove profitable on a given soil will depend, however, upon other characteristics of the soil, as well as upon the management of the land and the economic circumstances of the time. Type 140, for instance, which is very low in plant-food elements, may retain its productiveness indefinitely as a result of natural renewal by overflow.

Variations in Composition

Wide variation in the composition of different soils is noticeable from these analyses. Type 65, for example, with its 5,620 pounds of nitrogen to the acre, is about four times as rich in this element as is Type 16, mentioned above, with its 1,620 pounds. As is usually true, practically the same relative proportions hold for the organic carbon, an index of the organic matter, which in this case is 70,500 pounds in Type 65 and 18,550 pounds in Type 16.

The *total phosphorus* in the surface soils varies from 790 pounds an acre in Type 18 to twice this amount in Type 65, and between these two extremes all degrees of variation are found. It is the easily soluble or available phosphorus, however, that determines the immediate phosphorus fertility. Since the easily soluble forms are usually present in small amounts, they are subject to exhaustion by cropping. Furthermore some of the insoluble forms of native soil phosphorus can be rendered available thru the agency of certain crops, and the available phosphorus level of the soil thus raised. Phosphorus fertility is therefore not a permanent characteristic of any soil but may vary widely, even within small areas, and may be modified in a given area as a result of soil management practices.

Total potassium differs from total nitrogen and phosphorus in being present in much larger quantities, but like them varies widely in amount in different soil types. In the soils of Schuyler county the potassium content ranges in the surface layer from about 27,000 pounds to 37,000 pounds an acre. Most of this

Table 3.—PRINCIPAL SCHUYLER COUNTY SOILS:[1] Plant-Food Elements in the Surface Sampling Stratum, About 0 to 6⅔ Inches
Average pounds per acre in 2 million pounds of soil

Type No.	Type name	Total organic carbon	Total nitrogen	Total phosphorus	Total sulfur	Total potassium	Total magnesium	Total calcium
16	Rushville silt loam	18 550	1 620	870	....	34 390	5 750	6 550
18	Clinton silt loam	24 000	2 360	790	160	35 660	5 500	7 630
41	Muscatine silt loam	51 390	4 870	1 130	620	33 090	8 970	11 290
43	Grundy silt loam	54 010	4 320	1 030	....	31 770	9 540	13 330
65	Grundy clay loam	70 500	5 620	1 540	....	30 070	13 310	18 720
87	Sumner sandy loam (terrace)	20 940	1 740	980	....	26 960	5 340	4 560
107	Swan clay loam (bottom)	50 830	4 610	1 380	720	27 260	12 600	12 810
127	Harrison silt loam	41 330	3 420	900	640	32 080	5 200	8 430
134	Camden silt loam (terrace)	18 140	2 140	860	440	33 580	5 060	9 900
136	Brooklyn silt loam (terrace)	26 370	2 720	1 010	630	28 750	5 860	10 090
140	Browning silt loam (terrace)	13 340	1 260	840	....	37 520	12 180	20 040

[1]The samples representing the respective types were taken in neighboring counties. The less extensive types and some that are highly variable in their characteristics are not included in these analyses.

large supply is contained in undecomposed soil-forming minerals, in which form it is comparatively inaccessible to plants. The portion available to plants is associated with the soil colloids, or clay particles, and is present in relatively small amounts. In some soils under certain conditions this limited quantity is rather rapidly exhausted, while in other soils a plentiful supply is well maintained to meet the needs of growing crops.

Other basic elements are *calcium* and *magnesium.* They also occur in variable amounts, altho the quantities are relatively small compared with those of some soils found in other parts of the state. The smaller but more active portions of these elements, as with potassium, are associated with the fine clay portion of the soil. Soil acidity is largely a result of the loss, by leaching, of calcium and magnesium from the surfaces of the colloidal clay particles. As calcium and other bases are removed in drainage water, an equivalent amount of acid takes their place. This acidity, so harmful to certain crops, especially to some legumes, is corrected by liming, the acid being neutralized and the fine clay particles replenished with calcium and, in the case of dolomitic limestone, with magnesium.

Thus many of the conditions which determine soil productivity change, not only with the natural processes of soil development, such as weathering and leaching, but also with cropping and with different methods of soil management.

Rapid Chemical Tests for Certain Soil Properties

Knowledge of the total amounts of the different plant-food elements present in a soil is valuable chiefly as a basis for long-time programs of soil improvement, as explained above. In order to ascertain the immediate needs of a soil, a number of rapid field tests have been devised. Such a test for "soil reaction," or the need of the soil for limestone, is described in Circular 346 of this Station, "Test Your Soil for Acidity," mentioned many times on the preceding pages. The test for available phosphorus is described in Circular 421, "Testing Soil for Available Phosphorus."

Applied to the soils of Schuyler county, these tests show the majority of the types to be more or less acid in reaction (Table 2), only four out of eighteen showing a neutral reaction. In available phosphorus most of the types are low, only two being recorded as medium and none as high.

While of general interest, the data recorded in Table 2 with respect to acidity and avaliable phosphorus are not to be taken as a reliable index to the condition of the soils of individual farms or fields. In the first place the determinations for available phosphorus are usually made on samples taken from uncultivated land, which would be expected to differ in phosphorus content from similar soil that has been cropped for a long time. In the second place, as pointed out above, wide variations in acidity and available phosphorus are found within limited areas of soils of the same type, and detailed tests of individual fields must therefore be made.

Directions for making an available potassium test will be furnished by the Station by correspondence, or they may be obtained direct from the county farm adviser.

Soil Reports Published

1 Clay, 1911
2 Moultrie, 1911
3 Hardin, 1912
4 Sangamon, 1912
5 LaSalle, 1913
6 Knox, 1913
7 McDonough, 1913
8 Bond, 1913
9 Lake, 1915
10 McLean, 1915
11 Pike, 1915
12 Winnebago, 1916
13 Kankakee, 1916
14 Tazewell, 1916
15 Edgar, 1917
16 DuPage, 1917
17 Kane, 1917
18 Champaign, 1918
19 Peoria, 1921
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
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