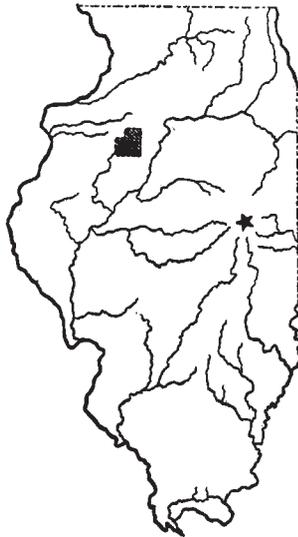


UNIVERSITY OF ILLINOIS
Agricultural Experiment Station

SOIL REPORT No. 64

STARK COUNTY SOILS

By ERIC WINTERS, Jr., R. S. SMITH, AND L. H. SMITH



URBANA, ILLINOIS, JUNE, 1939

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

C. G. HOPKINS

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

J. G. MOSIER

STATE ADVISORY COMMITTEE ON SOIL INVESTIGATIONS
1938-1939

G. F. Tullock, Rockford W. E. Riegel, Tolono
G. A. Lazier, Rochelle

RESEARCH AND TEACHING STAFF IN SOILS
1938-1939

J. C. Blair, Director of the Experiment Station
W. L. Burlison, Head of Agronomy Department

Soil Physics and Mapping

R. S. Smith, Chief
Herman Wascher, Assistant Chief
D. C. Wimer, Assistant Chief
J. E. Gieseking, Associate
G. D. Smith, Associate
R. S. Stauffer, Associate
F. F. Riecken, First Assistant
J. B. Fehrenbacher, Assistant
J. S. McVickar, Assistant
R. T. Odell, Assistant
T. G. Pearse, Assistant

Soil Fertility and Analysis

E. E. DeTurk, Chief
R. H. Bray, Assistant Chief
F. H. Crane, Assistant Chief
J. C. Anderson, First Assistant
S. R. Dickman, Assistant
I. R. Hoener, Assistant
L. T. Kurtz, Assistant

Soil Experiment Fields

F. C. Bauer, Chief
A. L. Lang, Assistant Chief
H. J. Snider, Assistant Chief
C. J. Badger, Associate
L. B. Miller, Associate
C. H. Farnham, First Assistant
P. E. Johnson, First Assistant
L. F. Marriott, Assistant

Soil Biology

O. H. Sears, Associate Chief
M. D. Appleman, Assistant

Soils Extension

C. M. Linsley, Assistant Professor
E. D. Walker, Extension Specialist

Soil Survey Publications

L. H. Smith, Chief

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 for the improvement of his land. At the same time the Experiment Station is furnished a scientific inventory of the soils of the state; and with such an inventory as a basis it can proceed intelligently to plan those fundamental investigations so necessary for the solution of 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.

CONTENTS

	PAGE
INTRODUCTORY NOTE.....	1
GEOGRAPHICAL AND HISTORICAL FEATURES.....	3
Agricultural Production.....	4
Climate	5
Topography and Drainage.....	6
FORMATION OF STARK COUNTY SOILS.....	6
Origin of Soil Material.....	6
How the Soils Were Developed.....	8
SOIL CLASSIFICATION AND MAPPING.....	10
SOIL TYPES OF STARK COUNTY: THEIR PROPERTIES, USE, AND MANAGEMENT.....	11
General Suggestions for Soil Management.....	11
Hickory gravelly loam, eroded.....	12
Berwick silt loam.....	13
Clinton silt loam.....	14
Miami silt loam.....	14
Tama silt loam.....	15
Muscatine silt loam.....	16
Grundy silt loam.....	17
Denny silt loam.....	18
Osceola silt loam.....	18
Grundy clay loam.....	19
Harpster clay loam.....	19
Huntsville loam, bottom.....	20
Littleton silt loam, terrace.....	20
Camden silt loam, terrace.....	21
Saybrook silt loam.....	21
Proctor silt loam.....	22
Brenton silt loam.....	23
Drummer clay loam.....	24
Vance silt loam.....	24
Harpster muck.....	25
SUMMARY OF CHARACTERISTICS OF STARK COUNTY SOILS.....	25

STARK COUNTY SOILS

By ERIC WINTERS, JR., R. S. SMITH, and L. H. SMITH¹

GEOGRAPHICAL AND HISTORICAL FEATURES

STARK COUNTY is situated in the northwest portion of the central area of Illinois. The county is practically square, measuring 18 miles on the south and east, but in the northwest corner lacking the township that contains the city of Kewanee; this township is included in Henry county. The total area of Stark county is about 284 square miles, or approximately 182,000 acres. Toulon, the county seat, and Wyoming are the two largest towns and both lie well toward the center of the county.

Two paved highways traverse the county from north to south, and two from east to west, giving ready access to every town. In recent years numerous secondary roads have been graveled, and now most farmsteads have all-weather connections with the main highways. At Wyoming two railroads cross and a third touches the southeast corner of the county at Speer.

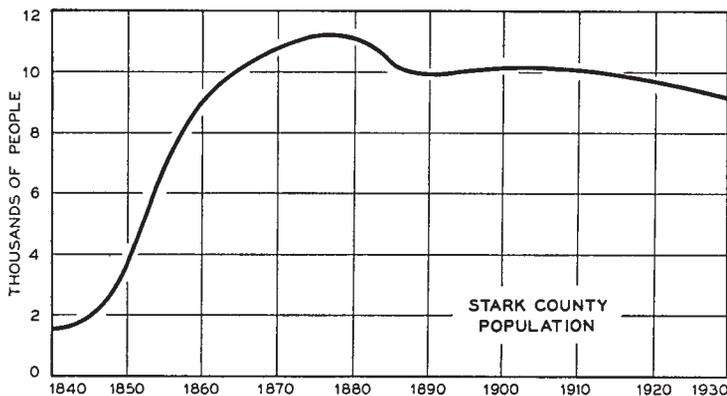


FIG. 1.—POPULATION TREND IN STARK COUNTY

A steady increase in population occurred between 1840, when there were 1,500 inhabitants, and 1880, when there were more than 11,000. Since the 1880 Census, population has gradually declined, only a few more than 9,000 inhabitants being enumerated in 1930. (*Figures are from the U. S. Census*)

The first settler who came to the county with his family was Isaac B. Essex. In the spring of 1829 he built a cabin on Spoon river in what is now called Essex township, probably west of the present town of Duncan. Other settlers followed soon thereafter and the population grew rapidly, reaching 11,000 by 1880, since which time it has declined somewhat (Fig. 1). During a period of optimistic speculation in 1836-37, numerous towns were laid out, several of which have since entirely disappeared.

Previous to its official creation in 1839, Stark county was a part of Putnam county, and legal business was transacted at Hennepin on Illinois river.

¹ERIC WINTERS, JR., formerly Associate in Soil Survey; R. S. SMITH, Chief in Soil Survey; L. H. SMITH, Chief in Charge of Publications of the Soil Survey.

Agricultural Production¹

Stark county has no large towns with manufacturing enterprises; it is primarily an agricultural county. Corn is the major crop, with oats second, and hay third. According to the U. S. Census the area devoted to corn since 1900

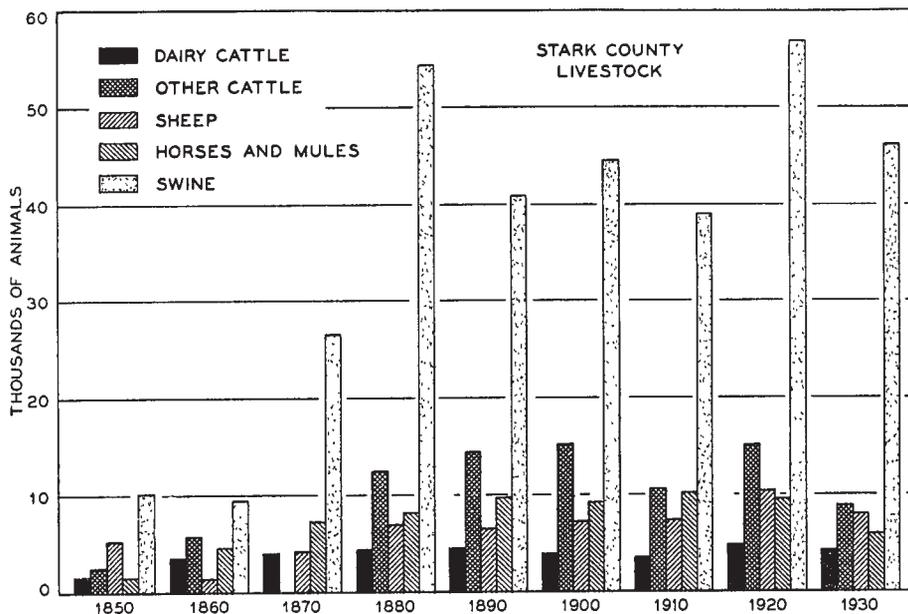


FIG. 2.—PRODUCTION OF PRINCIPAL CLASSES OF LIVESTOCK IN STARK COUNTY

In general, livestock production increased along with human population until about 1880, when the number of inhabitants reached its maximum. Livestock numbers remained fairly constant thereafter, with some exceptions, until the 1930 Census, when some decrease appears. (Figures are from the U. S. Census)

has exceeded 60,000 acres annually, which is approximately one-third the total area of the county. About 32,000 acres are planted to oats, and 12,000 to 15,000 are used for hay production. Wheat has been of minor importance, less than 2,000 acres being raised except for a short interval during the World War period. Barley has occasionally been popular in recent years, 5,000 acres having been planted in 1930.

After 1900 the acreage of legumes gradually increased until in 1930 a total of 5,000 to 6,000 acres of clover and alfalfa was grown.

More detailed trends in crop production since 1930 are given in "Illinois Crop and Live Stock Statistics." The most important crop change in this period has been the extensive substitution of soybeans for oats. Total plantings of soybeans increased from 2,000 acres to 16,000 acres between 1930 and 1935. About half the soybean acreage is cut for seed; the rest is used for hay. With the increase in soybeans, oats decreased from 34,000 acres to 25,000 acres.

The trends in livestock production in Stark county from 1850 to 1930 are

¹All crop and livestock statistics are from either the U. S. Census or "Illinois Crop and Live Stock Statistics," a joint publication of the Illinois State Department of Agriculture and the U. S. Department of Agriculture.

shown in Fig. 2. It will be noted that the number of dairy cattle has been fairly constant since 1860, when there were 3,500 head. The maximum number was 4,900 in 1920. The number of all cattle other than dairy cattle has fluctuated widely. Since 1880 the number of sheep has varied between 6,600 in 1890 and 10,500 in 1920, with an increase to 22,000 in 1935. The decline in the number of horses and mules from a maximum of 10,100 in 1910 to 6,130 in 1930 is typical of the trend in horse population thruout the corn belt. Swine are the most numerous class of livestock in Stark county. Their number has fluctuated widely, from a minimum of 9,600 in 1860 to a maximum of 56,600 in 1920.

Climate

Stark county is characterized by a humid temperate climate of the continental type (having a very wide range in temperature and an abundant rainfall). The highest temperature recorded was 111° F. in July, 1934; the lowest, 26° F. below zero in December, 1924, and again in February, 1933, giving a total range of 136 degrees. The average annual precipitation is 33.18 inches. These and the following data are from the Galva Weather Station located in Henry county a few miles west of the Stark county line, and are based on observations made over the twenty-four years from 1914 to 1937 inclusive.

The average date of the last killing frost in the spring is April 30; the earliest in the fall, October 15. This gives an average growing season of 167 days. The latest recorded killing frost in spring was May 25, 1925; the earliest in fall was September 25, 1928. The shortest growing season, 137 days, was in 1917; the longest, 194 days, was in 1924. The growing season is thus usually long enough to mature the crops commonly grown in the region, but occasionally when the spring is wet and planting delayed, early frosts may injure such crops as corn and soybeans.

The rainfall varies widely from the average of 33.18 inches. In 1927 the total precipitation was 47.98 inches, whereas in 1914 there was only 20.40 inches. All these figures include the water melted from the yearly snowfall, which has averaged 26.0 inches (about 10 inches of snow being equivalent to 1 inch of rain). Nearly two-thirds of the rain comes during the six months of April to September inclusive. The monthly averages, in inches, are: April, 3.09; May, 3.93; June, 3.80; July, 3.06; August 3.49; September, 4.26; giving a total of 21.63 inches as the average for the six-months period. The lowest precipitation recorded for these six months was 13.20 inches in 1930, and the highest, 31.52 inches in 1927, again illustrating the great fluctuations to be expected in rainfall.

Analysis of the daily records discloses that during the twenty-four years under consideration there have been a total of twenty rainless periods exceeding 30 days in length, that fell entirely or in part in the three months of June, July, and August, when moisture is so vital to the development of corn. A rainless period is defined as an interval during which no precipitation exceeding one-half inch is recorded in any 24-hour period. Of these twenty rainless periods, seven exceeded 40 days, and four exceeded 50 days. An interval of 50 days without appreciable rain will affect crop yields adversely on most soils, and such conditions may be expected one year in six. Attention is directed to the frequency of rainless periods in order to emphasize the importance of the moisture relations

of a soil in this region. Those soils that are drouth-resistant in the sense that they are able to supply adequate moisture to crops during rainless periods are to be preferred to soils that cannot hold a large reserve of moisture.

Topography and Drainage

The eastern third of Stark county owes its topography to the action of the Wisconsin glacier. The land area in the region of Lombardville and that lying to the southwest of the intersection of Routes 88A and 88 are outwash plains. These two areas are separated by a moraine which enters the county near Bradford and leaves it south of Castleton. The moraine reenters the county above Speer and covers a small area in the southeast corner. The morainal slopes are rather long, and they vary from undulating to rolling.

In the vicinity of Wyoming and to the west a different topography prevails. There are numerous level upland areas, or tablelands, which are surrounded by relatively short slopes resulting from headwater erosion. These slopes lead down to level bottomlands and terraces, which constitute over 11 percent of the total area of the county.

Spoon river and its tributaries drain the entire county. Walnut creek, which flows thru the southwestern township, is considered a tributary of Spoon river, since these two streams join a few miles south of the county line. The well-established channels of these streams are adequate to carry off the surface water of the county. There are only a few broad, level areas in which surface drainage is slow.

In Stark county few elevations exceed 800 feet. This height is attained east of Speer and west of Elmira, according to the U. S. Geological Survey topographical sheets. Other elevations include Toulon, 740 feet, and Osceola, 775 feet; the lowest elevation given, which is west of Wady Petra, is 621 feet.

FORMATION OF STARK COUNTY SOILS

Origin of Soil Material

Information about the nature of the parent materials from which a soil has been formed is always helpful in arriving at a better understanding of the properties of the soil. This is particularly true in Stark county, because the soils there are in a relatively early stage of development and the parent material still exerts a great influence.

The original bedrock of sandstone, shale, and limestone has been covered by glacial material to depths varying from several feet to a hundred feet or more. Except where it has since been exposed by erosion, the bedrock has not influenced soil development. The several species of glacial deposits are: first, till, some of which is old and highly weathered and some of which is of more recent deposit; second, outwash; and third, loessial or wind-blown material, which is distributed over the entire county in varying depths. Alluvial, or water-borne sediments, resulting from present-day erosion are still being deposited in the bottomlands. The following description of the origin and distribution of the glacial deposits will help to clarify their relation to present soil conditions.

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

The tremendous force exerted by the advancing ice leveled off hills, gouged out basins, and gathered up the resulting debris and carried it sometimes for hundreds of miles. When a warmer period occurred, the ice would melt and the rock fragments and other debris, much of which had been ground very fine, would be deposited on the land surface as a heterogeneous mixture called by geologists "glacial till." This term will be used later in the soil descriptions.

There were four great periods during which ice sheets moved down from the north. The several movements were separated by long intervals during which the climate was warm enough for the country to become clothed with vegetation. The third ice advance, called the Illinoian, covered all of Stark county, and during the succeeding warm interval the till was leached and weathered, and a soil developed.

Only the eastern part of the county was covered by the ice of the later, or fourth, glacial advance, called the Wisconsin glacier. The ridge on which Bradford and Speer are located represents the terminal moraine of the Wisconsin glacier and marks the western limit of this glaciation in that vicinity. The soil formed on the Illinoian till was destroyed in most places east of this boundary and became mixed with other materials carried in by the new advance.

As the ice of the Wisconsin glacier melted, the water carried huge quantities of sediments away from the ice front. The coarser material was deposited close to the moraine, forming the outwash plains on which Lombardville and Stark are located. The stratified sand and gravel resulting from the action of the outwash waters varies greatly in thickness, in places being almost absent, so that the old Illinoian till and soil may be found very close to the surface, where it exerts an unfavorable influence on the present soil.

Much of the fine silty material was swept along to the larger rivers, where it was deposited in the bottomlands. As the high waters receded, this fine material dried out and was then carried by the wind over the adjacent upland. Undoubtedly the wind deposition extended over a period of many years concurrent with the slow retreat of the glacier. During the warmer summer season the flood waters from the melting ice brought to the bottomlands fresh silty deposits, which were transported by the wind during the succeeding cold dry season when melting stopped. The silty blanket of rather uniform texture resulting from this wind deposition is called "loess," and it constitutes one of the most desirable soil-forming materials. The Mississippi and Illinois bottoms were probably the chief sources of the loess in Stark county, tho no doubt other sources, distant as well as local, contributed smaller quantities.

The depth of loess, which varies from about 30 to 60 inches on the Wisconsin outwash and till, is not sufficient to prevent these underlying materials from affecting the course of soil development. On the adjacent Illinoian till the thickness everywhere exceeds 120 inches where no erosion has occurred. At this

depth dissimilar strata appear to have little influence on the overlying soils, and no account need be taken of them as in the Wisconsin drift area.

The greater thickness of loess on the undisturbed Illinoian deposit is to be expected. On these ice- and water-covered areas wind deposition occurring before and during the retreat of the Wisconsin glacier did not persist as loess because it was subsequently reworked by these weathering agents. The only loess deposited on the Wisconsin glacial material was left, therefore, after the ice had retreated to the north. In general the loess rests directly on unleached material in the Wisconsin till area, in contrast to the leached substratum of the Illinoian till.

How the Soils Were Developed

As soon as the parent material was deposited it was subjected to the action of the weathering forces, and the processes of soil development began. Since weathering forces are most active near the surface and become less active with increasing depth, various stages of weathering occur at different depths. Thus

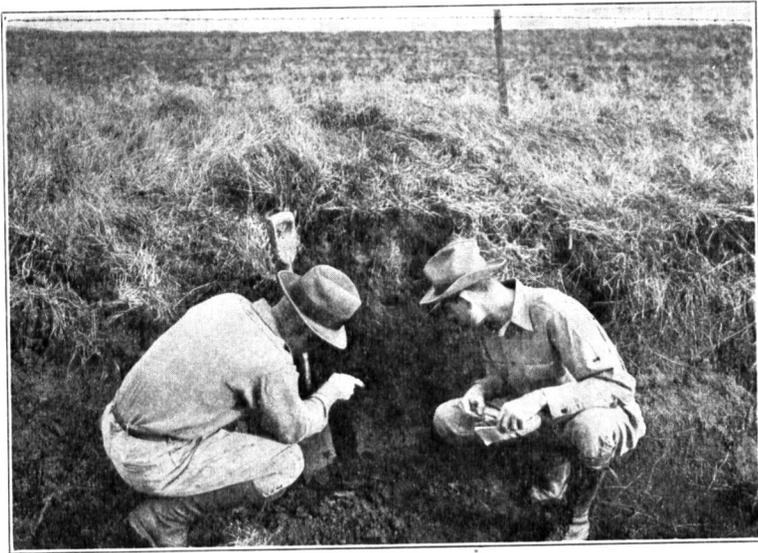


FIG. 3.—STUDYING THE SOIL PROFILE

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."

carbonates are leached first from the surface, and the decomposition of the minerals is most active near the surface. Likewise organic matter accumulates in the surface soil to a much greater extent than in the deeper horizons, as indicated by the darker color of the upper horizons. Thus gradually horizons are formed and the parent material acquires characteristics that permit it to be called a soil.

During the early stages in the life history of soils their distinguishing features are not clearly developed, and such soils are said to be young or to be in an early stage of development. As the time of weathering lengthens, the soil characteristics become more clearly developed and the horizons more easily distinguished. If an analogy is made to the development of a human being, the soil may be said to be progressing from infancy toward youth, and finally to maturity and old age. The characteristics of an undeveloped or youthful soil are largely determined by the parent material. As weathering continues, the influence of parent material on soil character decreases. It is therefore of more importance to know something about the materials from which the soils were developed in a region of youthful soils than in a region of old soils.

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

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

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

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

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

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

SOIL CLASSIFICATION AND MAPPING

In the soil survey the "soil type" is the unit of classification. A given soil type has the same horizon sequence and the same range in horizon properties—color, texture, and other characteristics—wherever it may occur. The differences in management may have brought about variations in the present productivity of two areas of the same type, yet both retain the same potential productive capacity.

It is important to emphasize the fact just mentioned—that any given soil type includes a range in properties—for one of the most difficult tasks in mapping soils is to recognize all variations that are of agricultural significance, and at the same time avoid introducing unnecessary, confusing details. The limits of

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

Type No.	Type name	Area in square miles	Area in acres	Percent of total area
8	Hickory gravelly loam, eroded.....	3.40	2 716	1.20
17	Berwick silt loam.....	5.31	3 398	1.87
18	Clinton silt loam.....	26.77	17 133	9.41
24	Miami silt loam.....	1.71	1 094	.60
36	Tama silt loam.....	62.76	40 166	22.06
41	Muscatine silt loam.....	54.28	34 739	19.08
43	Grundy silt loam.....	3.86	2 470	1.36
45	Denny silt loam.....	.05	32	.02
58	Osceola silt loam.....	2.57	1 645	.90
65	Grundy clay loam.....	2.19	1 402	.77
67	Harpster clay loam.....	1.98	1 267	.70
73	Huntsville loam, bottom.....	25.81	16 518	9.07
81	Littleton silt loam, terrace.....	1.69	1 082	.59
134	Camden silt loam, terrace.....	4.70	3 008	1.65
145	Saybrook silt loam.....	33.19	21 242	11.67
148	Proctor silt loam.....	26.55	16 992	9.33
149	Brenton silt loam.....	13.80	8 832	4.85
152	Drummer clay loam.....	12.96	8 294	4.56
158	Vance silt loam.....	.55	352	.19
210	Harpster muck.....	.33	211	.12
	Total.....	284.46	182 054	100.00

variation allowable within a type thus demand continual attention, first to define them properly, and second to make sure that the accepted limits are observed as the mapping progresses.

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, for the surface stratum of one soil type may be no different from that of another and yet the two types may be widely different in character as well as in agricultural value.

A list of the soil types of Stark county, as shown on the accompanying colored map, is given in Table 1, together with the area of each type in square miles and in acres and the percentage that each type constitutes of the total area of the county. The accompanying soil map shows the location and boundary of each type and indicates the positions of various identifying features such as streams, roads, towns, rural schools, dwellings, etc., as explained on the map.

SOIL TYPES OF STARK COUNTY: THEIR PROPERTIES, USE, AND MANAGEMENT

Twenty soil types have been recognized in Stark county. The following descriptions point out the more important characteristics of each type and suggest a system of utilization that is in harmony with the farming practice of the region and yet will maintain the soil in as productive a state as possible. A "productivity index" has been assigned to each type (see Table 2, page 26), which is an expression of its approximate productive capacity.

General Suggestions for Soil Management

Recommendations for the use and management of the various soil types in Stark county are based on a definite theory of soil-fertility maintenance which embraces the following sequence of practices, each of which is discussed below.

1. Drainage
2. Use of limestone on acid areas
3. Regular addition of fresh organic matter
4. Adoption of a good rotation
5. Additions of phosphorus and potassium as they become deficient
6. Adoption of certain erosion-control practices where needed.

Drainage.—In general it will be assumed in discussing the different soils that adequate drainage for each type has been provided. Where an impervious sub-soil would interfere with the effective operation of tile, this fact will be mentioned. Frequently it is unprofitable to carry out the other practices suggested unless drainage can be established and the soil thus given ready access to air.

Limestone.—Limestone should be added in the proper amount to any soil that is acid. Illinois Circular 346, "Test Your Soil for Acidity," gives directions for determining the lime requirement and may be obtained free on request to the Agricultural Experiment Station, University of Illinois, Urbana, Illinois. The county farm adviser may also be consulted. A large proportion of the soils of Stark county are acid, and must receive limestone before the other practices associated with good soil management can be expected to be effective.

Fresh Organic Matter.—Fresh organic matter is essential to maintain the microbiologic activity at a favorable level and to supply nitrogen to the soil. Either animal manure or legumes plowed under during the rotation will supply these needs. Sweet clover, the most desirable legume for green-manuring purposes, will not grow in acid soils; animal manure is more effective if the acidity has first been corrected.

Phosphorus and Potassium.—After the soil has been drained, limed, and supplied with organic matter, and a good rotation established, phosphorus, and in some cases potassium, may be needed for high yields. The directions for the phosphorus test, which are relatively simple, may be obtained free of charge by writing to the Experiment Station for Illinois Circular 421, "Testing Soil for Available Phosphorus." The help of the farm adviser will prove advantageous in carrying out this test as well as that for acidity.

Erosion Control.—This point is mentioned last, not because it is least important, but because the effectiveness of erosion-control practices is largely de-

pendent on the adoption of the other practices suggested above. When a soil is drained, has good structure as a result of organic additions, and is fertile enough to support a vigorous plant growth, the absorption and percolation of water is increased. Consequently there is less water to run off and cause erosion than on a soil not so managed. Supplemental practices are often desirable, however, where topography is very sloping and also during the interval when adjust-

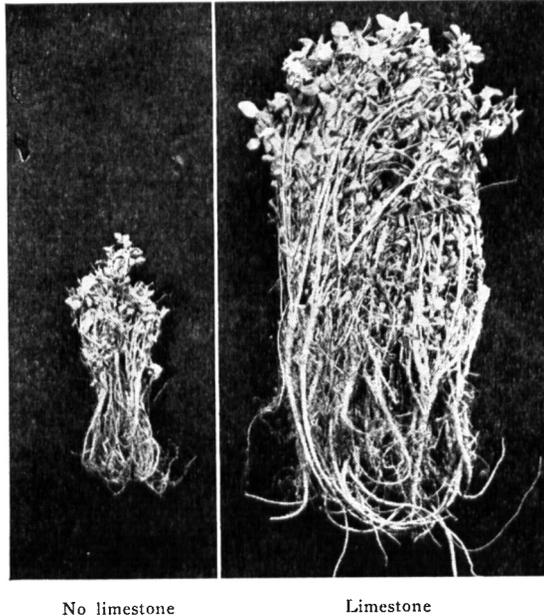


FIG. 4.—SWEET CLOVER DEMANDS LIMESTONE

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

ments in soil management are being made. The more important supplemental erosion-control practices include contour farming, strip cropping, terracing, and the construction of sodded waterways and check dams. These are mentioned further under the soil types to which they especially apply. For information concerning the construction of terraces consult Illinois Circular 459, "Terraces to Save the Soil."

Hickory gravelly loam, eroded (8)

Hickory gravelly loam, eroded, occurs on steep topography, where the slope is greater than 15 percent. Such areas are found most commonly along the stream bluffs and the deep gullies leading away from the bottomland. The type is not very extensive, there being only 3.4 square miles of it in Stark county.

In a virgin forest area of this type, where erosion is at a minimum, a brownish-yellow surface soil, usually but 2 to 5 inches thick, may still be

present. The subsurface is yellow. The reddish-yellow subsoil begins at a depth of 6 to 10 inches. Where the loess has been largely removed by erosion, the gravelly leached Illinoian till may be exposed. Frequently the till is shallow, and in such places bedrock is visible. East of Modena this soil type includes small areas where the calcareous Wisconsin till is present. The productivity index is 10.



FIG. 5.—A DESOLATE HILLSIDE OF HICKORY GRAVELLY LOAM

This area has become so badly eroded as to be usable only for timber. Hickory gravelly loam occupies 3.4 square miles in Stark county.

Use and Management.—Timber is the best cover for Hickory gravelly loam, eroded, tho slopes of less than 30 percent may be used for permanent pasture if care is taken to avoid overgrazing. This soil type cannot be cultivated because of the severe erosion that results.

Berwick silt loam (17)

Berwick silt loam is a light-colored soil that has developed on nearly level to undulating topography, where the slope is not more than 2 percent. It occurs in different parts of Stark county in association with Clinton silt loam, Type 18, near the major streams, where deciduous trees originally constituted the chief vegetation. The type covers about 5 square miles and has a productivity index of 5 to 6.

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

Use and Management.—Tho subdrainage is slow, Berwick silt loam usually occurs in relatively narrow areas not far from gullies into which drainage water

can be carried by means of open ditches and furrows. The soil is acid and low in organic matter. It is probably better adapted to timber production than to cropping; but if it is already cleared and good farming practices have been followed in the past, fair pasture and small-grain crops can be grown in average seasons. Satisfactory yields can be secured only thru the use of limestone followed by the growing of clover or by the application of manure.

Clinton silt loam (18)

Clinton silt loam is a light-colored soil found on the gently to strongly rolling topography near the larger streams. There are more than 26 square miles of this type in Stark county, and it is the most extensive forest soil in the county. It is also the most variable type in the county. The variations are due chiefly to a rather wide range in slope, 2 to 14 percent, tho the majority of slopes fall within a range of 3 to 10 percent. Usually the slopes are relatively short, and consequently the topography changes abruptly within short distances. For this reason it was impracticable, on a map of the scale used, to show the steeper phase as a separate type. On the accompanying soil map very small areas of Hickory gravelly loam, eroded, Type 8, are included with Clinton silt loam in many places. Because Clinton silt loam has a wide range of properties, it varies in productivity rating, the limits assigned being 5 for the most productive phase and 8 for the more rolling phase, where erosion is active.

Where erosion is not serious, the surface soil is a grayish-yellow friable silt loam. The subsurface, beginning at a depth of 5 to 7 inches, is more distinctly yellow than the surface and shows little indication of a definite structure. The subsoil, beginning at 14 to 18 inches, is a drabbish-yellow medium-plastic silty clay loam. Below 40 inches the material is more friable, and at 60 inches or below it is calcareous. As might be expected, considerable variation from the above description will be found where erosion has removed portions of the profile.

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

Tho not naturally a very productive soil, Clinton silt loam responds well to treatment. The first step in a program to increase yields is to correct the acidity thru the application of limestone. Following this a good rotation should be adopted, including the frequent growing of crops of either clover or alfalfa. Since phosphorus may now be or may soon become deficient, especially if legumes are grown, the test for available phosphorus described in Circular 421 should be made. This soil also responds well to manure, but the application of manure should be preceded by limestone treatment; otherwise the full value of the manure will not be realized. If no manure is to be had, tests for available potash should also be made.

Miami silt loam (24)

Miami silt loam is a light-colored soil that occupies about 1,000 acres in the area east and northeast of Modena, where the loess is underlain by Wisconsin till. The loess averages 40 to 60 inches in depth where there has been no erosion,

and rests directly on pink calcareous till which is friable and permeable. The portion of the profile above the till is very similar to that of Clinton silt loam, Type 18.

Since Miami silt loam occupies only 1.7 square miles in Stark county, and since it parallels Clinton silt loam, Type 18, in range of topography, adaptation, and management, the reader is referred to the discussion under Type 18, just given, for further information.

Tama silt loam (36)

Tama silt loam is the most extensive type in Stark county, covering nearly 63 square miles. It is found thruout the county except in the eastern portion, where Wisconsin till and outwash occur. It is a dark soil and is found on gently



FIG. 6.—TAMA SILT LOAM, ON THE RIGHT, ADJOINING A PASTURE OF HUNTSVILLE LOAM, BOTTOM

Tama silt loam is used mainly for corn, small grains, and temporary pasture. Huntsville loam, bottom is used mostly for permanent pasture.

to strongly rolling topography, the most common range in slope being from 3 to 8 percent tho slopes of 10 or 12 percent are found. Most of the topography is of erosional rather than constructional origin, and consequently the steeper slopes are normally short, which fact accounts for their not being shown as a separate type on the accompanying map. With the wide range in topography and erodibility which Tama silt loam presents, a great variation in properties and productivity occurs which cannot be indicated on a map of this scale. A productivity index of 3 to 6 has therefore been assigned.

On average slopes where erosion is not evident, the surface of Tama silt loam is a brown silt loam 5 to 8 inches thick. The subsurface is light brown to brownish yellow and extends to a depth of 12 to 18 inches. The subsoil is a brownish to reddish-yellow silty clay loam, readily permeable to water. Carbonates are seldom found closer than 70 inches from the surface.

Wide variations from the above description are to be expected where the steeper slopes have been cultivated for a number of years. Under these conditions varying amounts of surface soil and even subsoil have been removed

and, as a result, calcareous loess is found closer to the surface. In places all the loess has been washed off, exposing the Illinoian till. Bedrock is less frequently seen in this type than in the steeper phases of Clinton silt loam, Type 18.

Use and Management.—Tama silt loam on the less rolling areas is a good general farming soil if well handled. It should be tested for acidity, and limestone should be applied as indicated by the test. It is particularly well adapted to alfalfa, and the frequent use of this or other legumes is necessary in order to maintain the supply of organic matter and to provide a cover crop to help prevent erosion during the winter months, if this soil is to remain at a satisfactory productive level. Phosphorus, and perhaps potassium, may become deficient after legumes have been grown for a time. Manure, as well as legumes, gives good results on this soil.

On the more rolling areas Tama silt loam often requires special attention in order that erosion may be controlled. Fall plowing should be avoided under all circumstances, for the land needs a vegetative cover over winter. The steepest areas are best kept in permanent pasture. When corn is grown on the steeper slopes—which should be infrequently—rolling the stalks crossways to the slope is helpful in checking washing, if no winter crop is seeded. Sodding the small channels and waterways will greatly retard their harmful cutting and deepening. Strip cropping is suggested where the slopes are adapted to such a practice. Because of its permeability this soil is adapted to terracing. It is suggested that strip cropping or contour farming be practiced on all slopes where there is evidence of erosion; and if these practices are not sufficiently effective in preventing soil loss, that they be supplemented by terracing. However, where erosion is so far advanced that most of the loess has been removed, the less pervious Illinoian till underneath will make terracing inadvisable.

Muscatine silt loam (41)

Muscatine silt loam, the second most extensive type in Stark county, covers more than 54 square miles. It occurs on the smoother topography, chiefly in association with Tama silt loam, Type 36. The loess on which Muscatine silt loam has developed is 120 inches or more thick, except in an area in the eastern part of the county, where this type is associated with Saybrook silt loam, Type 145. In this area it occupies the more level land, where the loess is consistently more than 50 inches thick. Muscatine silt loam is a dark soil, higher in organic matter than Tama, and usually medium acid in reaction. The rating of 2 is given as its productivity index.

The surface is a faintly granular brown silt loam 8 to 10 inches thick. The subsurface is yellowish brown and extends to a depth of 16 to 20 inches. The subsoil is a yellowish-brown silty clay loam that breaks into small subangular fragments. The profile is friable thruout and absorbs water readily. Carbonates usually occur at a depth of 50 to 60 inches or deeper, tho occasionally they are found as close to the surface as 40 inches. The depth to carbonates seems to depend in part on the distance from an established drainage channel, profiles closer to a channel usually being more deeply leached.

Use and Management.—All grain crops suited to the region do well on Mus-

catine silt loam. Either the use of manure or the growing of clover is necessary in order to maintain the supply of organic matter and to keep the productivity level high. This soil, however, is more durable than Tama silt loam, Type 36, and will stand more abuse without immediately disastrous results. A stand of red clover can usually be obtained in favorable seasons without limestone, but better growth is obtained after an application of limestone. For alfalfa and sweet clover, limestone applications are necessary. After several crops of clover have been grown, phosphate may be highly profitable on wheat.

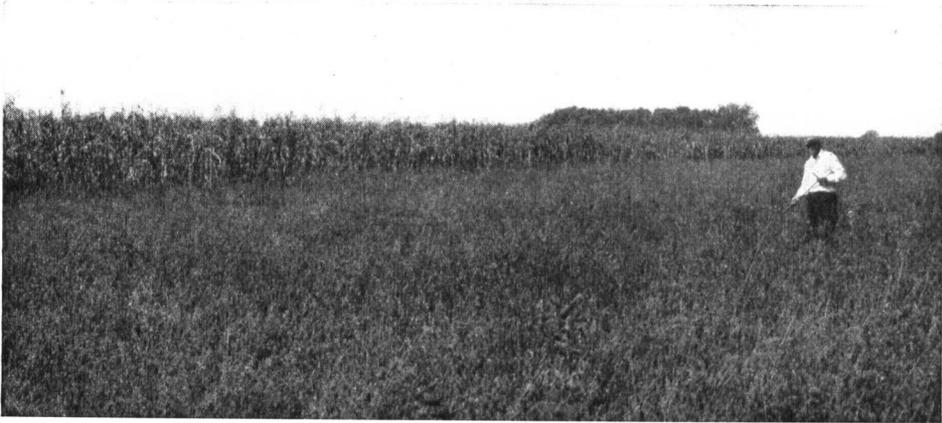


FIG. 7.—CORN AND SWEET CLOVER ON MUSCATINE SILT LOAM

Muscatine silt loam is the second most extensive soil type in Stark county. Fortunately it is one of the more productive types.

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

Grundy silt loam (43)

Grundy silt loam is a dark soil developed on nearly level topography. It occurs, for the most part, in the western half of Stark county in association with the larger areas of Muscatine silt loam, Type 41. Nearly 4 square miles is mapped as Grundy silt loam.

The surface varies from a dark-brown faintly granular silt loam to silty clay loam 8 to 10 inches thick. The subsurface extends to a depth of 16 or 18 inches and is a little heavier and usually darker than the surface. The subsoil is a brownish or yellowish-drab clay loam having dark-coated and angular structural particles. The lower part of the subsoil becomes more friable, and at 35 to 50 inches carbonates are usually present. The productivity index is 1.

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

Lime usually is not needed for red clover, tho it is advisable to test for acidity

before seeding alfalfa or sweet clover. Regular use of manure or clovers should be made in order to provide a supply of fresh organic matter. Grundy silt loam is a productive, durable soil and needs only good farming and the growing of clovers or the application of manure to maintain a high productive level for many years. It should be realized, however, that eventually even this soil will need fertilizer treatment.

Denny silt loam (45)

Denny silt loam is a dark soil found in some of the small depressions in association with Muscatine silt loam, Type 41. It is of very limited extent in Stark county, only 32 acres showing as such on the map, but its recognition is important because it has low productivity compared with Muscatine. Many areas of Denny are too small to be shown on a map of this scale. A productivity index of 7 is assigned to this type.

The surface is a grayish-brown silt loam 7 to 9 inches thick. The subsurface is a brownish-gray rather friable silt loam. The subsoil, beginning at a depth of 15 to 20 inches, is drabish gray and usually a plastic clay loam tho occasionally the texture may be rather silty to a considerable depth. Carbonates are rather deep, considering the topography of this type, seldom being found closer to the surface than 60 inches.

Use and Management.—This soil is acid and low in organic matter, and crop yields consequently are not high. Surface drainage is slow because of the level topography; and the plastic, impervious subsoil limits the effectiveness of tile. Hence response to soil treatment is often disappointing. However, because of the small size of a Denny area, often less than an acre, a farmer is probably justified in handling it in the same manner as the adjacent land.

Osceola silt loam (58)

Osceola silt loam is a dark soil found only in those southeast and northeast portions of Stark county that are covered with glacial outwash. It is most frequently developed on level land or slopes of not more than 1 percent, tho several areas have slopes as great as 2 percent or more. On the more undulating topography the occurrence of this type can be directly traced to the presence of the acid weathered Illinoian gumbotil 20 to 40 inches below the surface. In depressions its genesis is probably similar to that of Denny silt loam, Type 45, which it resembles in many respects. The type covers, all told, about 2½ square miles in Stark county.

The surface is a grayish-brown silt loam 6 to 10 inches thick. The subsurface is a brownish-gray silt loam that often shows light gray in the lower part. The subsoil, beginning at a depth of 14 to 22 inches, is a gray and pale-yellow to drabish-gray plastic clay loam. Often the subsoil is very thick, since it may join the underlying gumbotil, which has similar plastic properties. The productivity index varies from 4 to 7, depending on the following conditions: (1) the thickness of the outwash overlying the Illinoian gumbotil; (2) whether the topography will permit surface drainage; and (3) the thickness of the gray layer developed in the subsoil.

Use and Management.—On Osceola silt loam erosion is not a problem except on a few slopes, where suitable precautions are advisable. As might be expected with a heavy subsoil, underdrainage is not good even when tile are used. Response to treatment is therefore often disappointing, particularly in unfavorable seasons.

This soil is acid and low in organic matter. Alfalfa cannot be recommended because of the unfavorable moisture conditions frequently prevailing, but sweet clover will grow well after sufficient lime has been applied. Both phosphorus and potassium are low and must be supplied if good yields are to be obtained.

Grundy clay loam (65)

Grundy clay loam is a dark soil occurring in depressions and on large flats. It is found in small areas which, all told, amount to little more than 2 square miles. It is neutral in reaction and high in organic matter. Small areas of Harpster clay loam, Type 67, are often present.

The surface, which is 8 to 10 inches thick, is a black clay loam showing a definite granular structure. The subsurface, extending to a depth of 16 or 18 inches, is black to drabish-black. The subsoil is a yellowish-drab clay loam having dark-coated and angular structural particles. Carbonates are present at 35 to 50 inches. The productivity index is 1.

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

Harpster clay loam (67)

Harpster clay loam is a dark soil that occurs chiefly in depressions in association with both Grundy clay loam, Type 65, and Drummer clay loam, Type 152. It is strongly alkaline and high in organic matter. Many areas are too small to be shown on the map but they are easy to recognize and should be looked for in clay-loam areas. Approximately 2 square miles of this type is shown on the map. It is given a productivity index of 2.

The surface, 5 to 10 inches thick, is a black clay loam that usually appears somewhat gray when dry, because of the large amount of shell fragments present. The subsurface soil, as well as the subsoil, is a grayish-drab clay loam which usually, tho not always, contains shell fragments. Lime concretions are nearly always present somewhere in the profile.

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

Huntsville loam, bottom (73)

Huntsville loam, bottom, is a dark soil that occurs on first bottoms along the rivers and streams. It is subject to occasional overflow. The total area of this soil type mapped in Stark county is somewhat in excess of 25 square miles.

Being formed from recent alluvial sediments, this type shows little profile development and the soil varies in character according to the nature of the parent material. In general the texture is silty, tho occasional areas are sandy.



FIG. 8.—A CHARACTERISTIC VIEW OF HUNTSVILLE LOAM, BOTTOM

This is the only soil type mapped as bottomland in Stark county. Because of overflow, its major uses are for permanent pasture and for corn, which can be seen in the background.

The surface is brown to dark brown, and grades with depth to a lighter color. It is neutral in reaction and high to medium in organic matter. Because of differences in overflow hazard, the productivity index varies from 2 to 5.

Use and Management.—Practically all the bottom along Camp creek and south of Wyoming along Spoon river is cultivated. On Spoon river where the bottom is wide, overflow is relatively infrequent, as suggested by scattered fields of winter wheat. Overflow on this soil type is more common elsewhere, but the land drains early enough in the spring to permit growing a corn crop most years. Many of the narrow bottoms are in pasture and timber. Because of the addition of sediment during overflow, no treatment is recommended for Huntsville loam, bottom.

Littleton silt loam, terrace (81)

Littleton silt loam, terrace, is a dark soil occurring on second bottomlands. The topography is undulating, with occasional slopes into the bottom that approach a gradient of 5 percent. The land is covered by overflow only during the highest floods, and then the water never remains for any great length of time. A few areas near West Jersey are high enough above the bottom to eliminate all danger of overflow. The total area of this soil type in the county amounts to about 1,000 acres. The productivity index ranges from 2 to 3.

Except for its position on terraces, the chief difference between this soil type

and Muscatine silt loam, Type 41, is the presence in this type of stratified sand and gravel at 80 inches or more below the surface. The profile resembles that of Muscatine on similar topography and the same recommendations for use and management apply to both types (see page 16).

Camden silt loam, terrace (134)

Camden silt loam, terrace, is a light-colored soil developed on second bottomlands. The total area in the county amounts to practically 3,000 acres. Topography for the most part is level to undulating, with a few steeper slopes confined to the breaks between the terrace and bottom. This soil, which is acid and low in organic matter, has been assigned a productivity index of 5.

The surface is a brownish-gray to yellowish-gray nearly structureless silt loam 5 to 7 inches thick. The subsurface is a yellowish-gray friable silt loam that extends to a depth of 16 to 20 inches. The subsoil is a drabish-yellow medium-plastic clay loam having subangular drabish-coated structural particles. Below 35 inches the material becomes more friable. Stratified sand and gravel are usually present at 80 inches or below.

Use and Management.—Camden silt loam, terrace, is not a naturally productive soil, but it responds well to treatment. Limestone should be applied in amounts indicated by the test described in Circular 346. Either additions of manure or the plowing under of legumes will supply the necessary organic matter and nitrogen. Phosphorus is usually deficient and should be used if high yields are to be attained.

If the productivity of this soil is increased, and then maintained with good farming practices, erosion should not be a serious problem. However, the steep slopes into the bottom should be protected from erosion, preferably by keeping them under a good pasture cover.

Saybrook silt loam (145)

Saybrook silt loam is a dark soil found in that part of eastern Stark county which is covered by Wisconsin till. The topography is undulating to rolling, the slopes ranging between 1 and 10 percent tho the usual range is from 2 to 5 percent. The till is covered by loess to an average depth of 50 to 70 inches on level topography. South of Bradford some of these level areas have been separated in the survey because of the deeper loess, and called Muscatine silt loam, Type 41; but many similar areas of Muscatine of small size occurring within Saybrook areas are not shown. The content of organic matter is high to medium, and the reaction is medium acid. The type as mapped covers an area of more than 33 square miles. Because of the wide range in the properties of this soil type, the productivity index varies from 2 to 5.

On slopes of 3 percent or less the upper profile of this type is the same as that of Muscatine (page 16), but differences are found in the deeper horizons: carbonates are closer (45 to 50 inches) and the calcareous loess rests directly on calcareous till at a depth of 50 to 70 inches.

The following description applies to areas of Saybrook silt loam that have been developed on slopes greater than 3 percent. The surface is a brown to

light-brown silt loam 4 to 8 inches thick, the depth depending on the degree of erosion. The subsurface is light brown to brownish yellow. The subsoil, which begins at a depth of 10 to 18 inches, is a brownish-yellow silty clay loam which, in its lower portion, often takes on the pink to reddish color of the till. Pebbles are often noticed in this horizon. Pink calcareous friable Wisconsin till is found at a depth of 30 to 50 inches.



FIG. 9.—SHEEP GRAZING ON SAYBROOK SILT LOAM

One of the more extensive soil types in Stark county, Saybrook silt loam is a good soil for general farming. It occurs on rolling topography, and as it is well drained it is well adapted for sheep.

Use and Management.—Because of the range in topography of Saybrook silt loam, considerable variation is to be expected in its properties. On slopes of less than 3 percent it can be handled the same as Muscatine silt loam, Type 41. Where the slope exceeds 3 percent, constant effort should be made to avoid loss of soil material by erosion. This means that good soil-management and crop-management practices must be followed. The surface should be tested for acidity and lime applied as needed. Alfalfa does well after liming and makes a good cover for steep slopes. Phosphates will be needed after several crops of legumes have been removed.

Many slopes of Saybrook silt loam are long enough to be adapted to strip cropping. Other means of reducing erosion losses include the avoidance of fall plowing, and the performance of all tillage and other operations on the contour rather than up and down the slope.

Proctor silt loam (148)

Proctor silt loam is a dark soil developed over glacial outwash in the eastern part of the county. Most of the 26 square miles occupied by this type is rather level. Few slopes exceed 3 percent except in narrow strips along the streams.

The organic-matter content is medium, the reaction acid, and the productivity index is 3.

The surface, which is 6 to 10 inches thick, is a brown to light-brown silt loam. The subsurface is a light-brown to brownish-yellow silt loam and may have a grayish layer in the lower portion. The subsoil, which begins at a depth of 16 to 22 inches, is a brownish-yellow silty clay loam. Below 50 inches and usually above 65 inches, stratified sandy, silty, or gravelly outwash is found. Near the Wisconsin moraine the outwash is highly calcareous, but at increasing distances from the moraine lesser amounts of calcareous material are present.

Use and Management.—Proctor silt loam is well drained because of its pervious substratum, and it responds well to good farming practices. Addition of manure or the plowing under of legumes at frequent intervals is suggested. When limed, the soil is well adapted to alfalfa, but this crop cannot be grown long without phosphorus becoming deficient. Erosion is not serious except on the sloping topography near the streams.

Brenton silt loam (149)

Brenton silt loam is a dark soil found in association with Proctor silt loam, Type 148, on the glacial outwash area. It is confined to the more level topography, the slopes not exceeding $1\frac{1}{2}$ percent. It further differs from Proctor in



FIG. 10.—A FARM SCENE ON BRENTON SILT LOAM

The excellent crops of corn and clover and the good farm buildings indicate the high natural productivity of this soil. Ordinary good farming will keep this soil in productive condition for many years.

having a darker color, which is related to its higher content of organic matter. The area occupied amounts to nearly 14 square miles. The productivity index is 2.

The surface is a faintly granular dark-brown silt loam that is slightly acid in reaction. The subsurface, beginning at a depth of 8 to 10 inches, is a drabish-brown to light-brown silt loam that extends to a depth of 16 to 20 inches. The

subsoil is a yellowish-drab silty clay loam that breaks into dark-coated angular to subangular structural particles. As in Proctor silt loam, Type 148, stratified outwash, usually calcareous, is found below 50 inches.

Use and Management.—Brenton silt loam, tho not so productive as some clay loams, is nevertheless a very productive soil when well managed, being comparable to Muscatine silt loam, Type 41, in this regard. Erosion is seldom of concern, as the slopes are very gentle. Red clover will usually grow without the addition of limestone; and frequently sweet clover will do so, but it is wise to test the soil for acidity before seeding sweet clover. Ordinary good farming practice will keep this soil in a productive condition for many years. Eventually, however, fertilizer treatment with phosphorus, and probably with potassium, will be needed.

Drummer clay loam (152)

Drummer clay loam is a dark soil occurring in depressions along drainage channels and on extended flats in the eastern part of the county, which is covered by Wisconsin till and outwash. A productivity index of 1 is assigned to this soil type. Frequently small areas of Harpster clay loam, Type 67, not shown on the map, are encountered within this type. As mapped, the type occupies practically 13 square miles.

The surface is a granular black clay loam high in organic matter and neutral in reaction and about 10 inches thick. Pebbles are frequently present. The sub-surface is a black to drabish-black clay loam with a coarse granular structure. At a depth of 15 to 18 inches the color becomes a mixed gray and pale yellow, and the structural particles become angular and dark coated. Below 40 inches yellow becomes more prominent; carbonates are usually present above 50 inches.

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

Vance silt loam (158)

Vance silt loam is a light-colored soil developed on glacial outwash near the larger streams in the eastern part of the county. Since its slope varies from 1 to 8 percent, it must be protected against erosion. This soil type is of minor importance, there being only .55 square mile in Stark county. The productivity index ranges from 5 to 6.

Except for the presence of occasional pebbles, the upper part of the profile of Vance silt loam closely resembles that of Clinton silt loam, Type 18, on similar topography. At a depth of 40 to 60 inches outwash similar to that found under Proctor silt loam, Type 148, occurs.

Use and Management.—Recommendations for the use and management of Vance silt loam are the same as those suggested for Clinton silt loam, Type 18, see page 14.

Harpster muck (210)

Harpster muck is a dark soil developed in depressions and pond-like areas. It occurs as a single area of about 200 acres near the foot of the moraine northwest of Speer. Until very recent times this area has been covered by shallow water; consequently little or no horizon development has taken place. It is extremely high in organic matter and alkaline in reaction. The productivity index is 4.

The surface is a brown to black mucky loam containing shell fragments. The high content of organic matter makes the soil very light in weight and fluffy in structure when dry. Layers of brown partially decomposed peaty material are common. At depths varying from 30 to 80 inches or more, the muck rests on sand, silt, or clay.

Use and Management.—When drained and cultivated, the surface of Harpster muck will slowly subside as the organic matter decomposes, so that after a number of years it may be necessary to deepen the drainage outlets. Potassium is usually needed for the satisfactory growth of corn. This soil is not well adapted to small-grain crops because of the tendency of those crops to lodge.

SUMMARY OF CHARACTERISTICS OF STARK COUNTY SOILS

A summarized statement of the agriculturally more significant characteristics of the soil types shown on the map is presented in Table 2, page 26. The columns headed "productivity indexes" are intended to give an idea of the relative producing capacity of the different soil types for the various crops. Soils that have ratings of 5 or lower for the field crops are given ratings for pasture and timber also.

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

In this connection it is recognized that soils differ in their capacity to respond to soil treatment, and that this difference is not brought out in Table 2. Clinton silt loam, for example, which rates 5 to 8, responds well on the better phases to good soil-treatment and management methods; whereas, Denny silt loam, rating 7, is disappointing in its response. Since there are difficulties in trying to present with complete satisfaction this kind of information in simple index terms, the reader is referred to the management paragraph under each soil type for detailed discussion.

TABLE 2.—STARK COUNTY SOILS: SUMMARY OF CHARACTERISTICS

Type No.	Type name	See page ¹	Topography ²	Drainage ³		Reaction	Available phosphorus	Organic matter	Productivity indexes ⁴		
				Surface	Under				Field crops	Pas-ture	Forest
8	Hickory gravelly loam, eroded	12	Steep	Excessive	Moderate	Variable	Variable	Low	10	C	B
17	Berwick silt loam.....	13	Nearly level to undulating	Moderate	Slow	Acid	Low	Low	5-6	B	B
18	Clinton silt loam.....	14	Gently to strongly rolling	Moderate to rapid	Moderate	Acid	Low	Low	5-8	B	A
24	Miami silt loam.....	14	Gently to strongly rolling	Moderate to rapid	Moderate	Acid	Low	Low	5-7	B	A
36	Tama silt loam.....	15	Gently to strongly rolling	Moderate to rapid	Moderate	Medium acid	Low	Medium	3-6	..	..
41	Muscataine silt loam.....	16	Undulating to gently rolling	Moderate	Moderate	Medium acid	Medium	Medium to high	2	..	..
43	Grundy silt loam.....	17	Nearly level	Slow	Moderate	Slightly acid to neutral	Medium to high	High	1	..	..
45	Denny silt loam.....	18	Nearly level	Slow	Slow	Acid	Low	Medium to low	7	B	C
58	Osceola silt loam.....	18	Nearly level to undulating	Slow to moderate	Slow	Acid	Low	Medium to low	4-7	B	C
65	Grundy clay loam.....	19	Nearly level	Slow	Moderate	Neutral	Medium to high	High	1	..	..
67	Harpster clay loam.....	19	Nearly level	Slow	Moderate	Alkaline	High	High	2	..	..
73	Huntsville loam, bottom.....	20	Nearly level to undulating	Moderate to slow	Moderate	Slightly acid to neutral	High	Medium to high	2-5	..	..
81	Littleton silt loam, terrace.....	20	Nearly level to gently rolling	Moderate	Moderate	Slight Acid	Medium	Medium to high	2-3	..	..
134	Camden silt loam, terrace.....	21	Nearly level to gently rolling	Moderate	Moderate	Acid	Low	Low	5	B	A
145	Saybrook silt loam.....	21	Undulating to rolling	Moderate to rapid	Moderate	Medium acid	Medium to low	Medium	2-5	..	..
148	Proctor silt loam.....	22	Undulating to gently rolling	Moderate	Moderate	Acid	Low	Medium	3	..	..
149	Brenton silt loam.....	23	Undulating	Moderate	Moderate	Medium acid	Medium	Medium to high	2	..	..
152	Drummer clay loam.....	24	Nearly level	Slow	Moderate	Neutral	Medium to high	High	1	..	..
158	Vance silt loam.....	24	Undulating to rolling	Moderate	Moderate	Acid	Low	Low	5-6	B	A
210	Harpster muck.....	25	Nearly level	Slow	Moderate	Alkaline	Medium to high	Very high	4	..	..

¹For description of soil type turn to page indicated.

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

³Of the terms used to express character of drainage, *moderate* indicates the most desirable drainage.

⁴The index number assigned to a soil type for production of field crops is based on its ability to produce the major crops grown in the region, without soil treatment but with the soil in a cleared and drained condition. The scale used is 1 to 10, the *most productive soil* in the state being rated as 1 and the *least productive* as 10. The rating for pasture and for forest land is expressed by the letters A, B, and C, A representing the best and C the poorest.

SOIL REPORTS PUBLISHED

1 Clay, 1911	33 Saline, 1926
2 Moultrie, 1911	34 Marion, 1926
3 Hardin, 1912	35 Will, 1926
4 Sangamon, 1912	36 Woodford, 1927
5 LaSalle, 1913	37 Lee, 1927
6 Knox, 1913	38 Ogle, 1927
7 McDonough, 1913	39 Logan, 1927
8 Bond, 1913	40 Whiteside, 1928
9 Lake, 1915	41 Henry, 1928
10 McLean, 1915	42 Morgan, 1928
11 Pike, 1915	43 Douglas, 1929
12 Winnebago, 1916	44 Coles, 1929
13 Kankakee, 1916	45 Macon, 1929
14 Tazewell, 1916	46 Edwards, 1930
15 Edgar, 1917	47 Piatt, 1930
16 Du Page, 1917	48 Effingham, 1931
17 Kane, 1917	49 Wayne, 1931
18 Champaign, 1918	50 Macoupin, 1931
19 Peoria, 1921	51 Fulton, 1931
20 Bureau, 1921	52 Fayette, 1932
21 McHenry, 1921	53 Calhoun, 1932
22 Iroquois, 1922	54 Ford, 1933
23 DeKalb, 1922	55 Jackson, 1933
24 Adams, 1922	56 Schuyler, 1934
*25 Livingston, 1923	57 Clinton, 1936
26 Grundy, 1924	58 Washington, 1937
27 Hancock, 1924	59 Marshall, 1937
28 Mason, 1924	60 Putnam, 1937
29 Mercer, 1925	61 Wabash, 1937
30 Johnson, 1925	62 Vermilion, 1938
31 Rock Island, 1925	63 St. Clair, 1938
32 Randolph, 1925	64 Stark, 1939

*(*Withdrawn from general circulation)*

Requests from libraries and other public agencies desiring to complete their files of these reports will be given special consideration.

Accessibility Statement

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at www.section508.gov.

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email Section508@oc.usda.gov. If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the [USDA Section 508 Coordination Team](#).

Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

- (1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;
- (2) fax: (202) 690-7442; or
- (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.