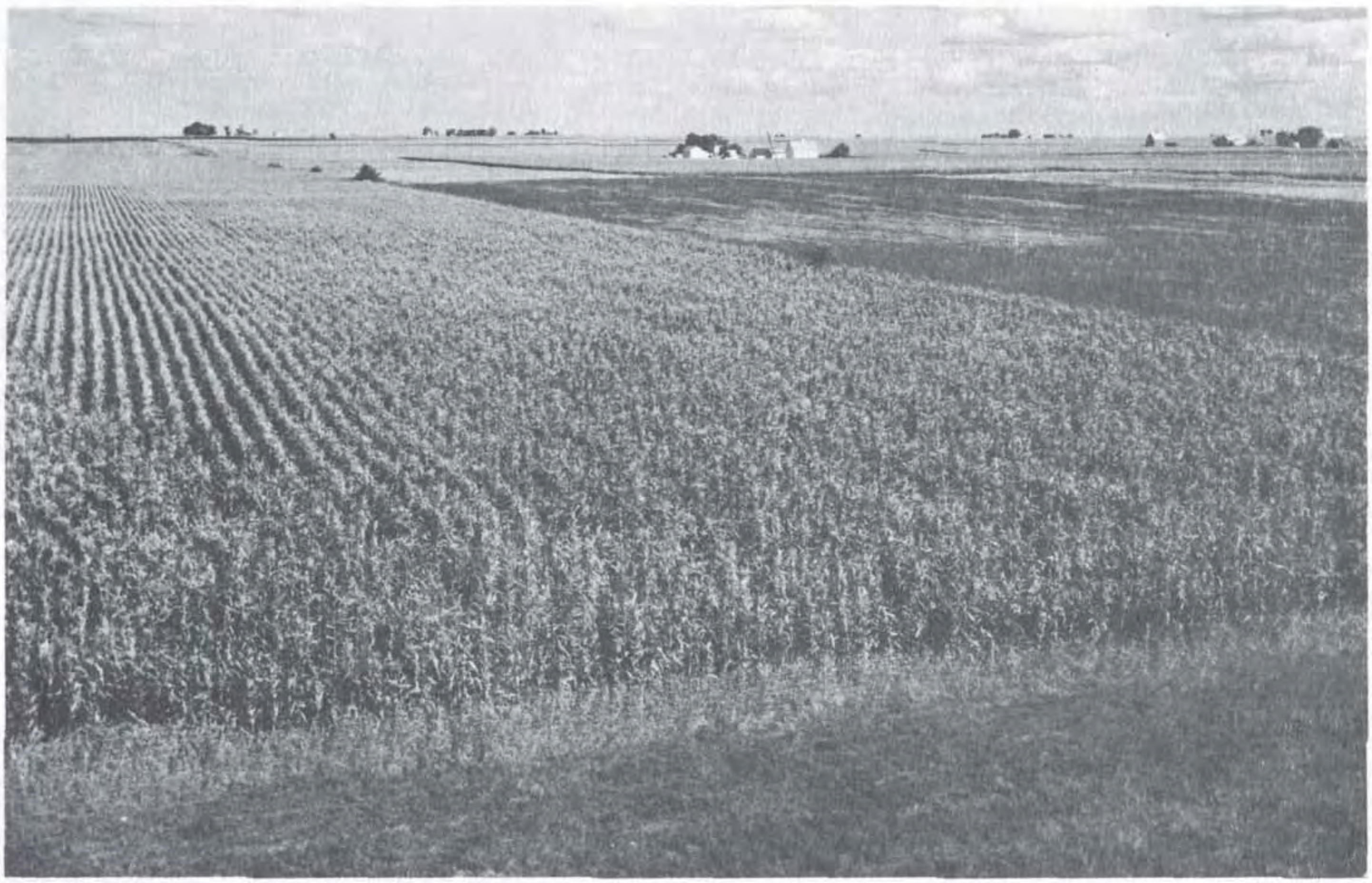
SOIL SURVEY

Issued August 1971

Douglas County, Illinois



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
ILLINOIS AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1962–65. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Douglas County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

Illinois Agricultural Experiment Station Soil Report No. 89

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Douglas County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in numerical order by map symbol and gives the management group of each.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the management groups.

Foresters and others can refer to the section "Use of the Soils for Woodland."

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for recreation areas in the section "Use of the Soils for Recreation."

Engineers and builders can find, under "Use of the Soils in Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Douglas County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

U.S. GOVERNMENT PRINTING OFFICE: 1971 O—383-851

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

Issued August 1971

Cover picture: **Typical area in the Drummer-Flanagan association. This association is well suited to corn and soybeans.**

This page intentinoally left blank.

SOIL SURVEY OF DOUGLAS COUNTY, ILLINOIS

BY D. C. HALLBICK, SOIL CONSERVATION SERVICE, AND J. B. FEHRENBACHER, UNIVERSITY OF ILLINOIS

SOILS SURVEYED BY D. C. HALLBICK, IN CHARGE, F. L. AWALT, AND D. R. MAPES[1], SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE ILLINOIS AGRICULTURAL EXPERIMENT STATION

DOUGLAS COUNTY, in the east-central part of Illinois (fig. 1), has an area of 420 square miles, or 268,800 acres. In 1960, the population of the county was 19,243. Tuscola, the county seat, had a population of 3,875.

Most of Douglas County is level to gently sloping. The topography is more rolling in areas near the two major streams, which flow generally north to south. The Kaskaskia River, in the western part of the county, flows toward the Mississippi River, and the Embarras River, in the eastern part, flows toward the Wabash and the Ohio. The level to gently sloping areas (about 90 percent of the county) consist mostly of dark-colored prairie soils, and the more rolling areas consist mostly of light-colored, timbered soils that are generally better drained.

Farming is the main enterprise in the county. Most farms are of the cash-grain type. Corn and soybeans are the main crops, but wheat, oats, and hay are also grown. A small acreage of broom corn is grown in the vicinity of Arcola, and a small acreage of hybrid seed corn is grown in the vicinity of Tuscola. Raising livestock is a minor enterprise in all areas of the county except the southwestern part. In this area dairy cows, horses, and turkeys are raised, and small grain and hay are grown for feed.

General Nature of the County

Douglas County was organized in 1859. Before that time it had been a part of other counties of Illinois. The first settlement was established in 1829 near the present site of Camargo. In 1850 the Federal Government passed an act that gave wet areas to the State. Money from the sale of the land was to be used to provide drainage, and most drainage ditches had been built by about 1878. By 1855 the Illinois Central Railroad had been built through the county and provided market facilities.

Douglas County has a well-developed system of roads. Both Federal and State highways cross the county. In addition, there are hard-surface roads that connect small towns, and there are rural roads that generally run along section lines. Several railroads serve the county, and there is an airport for small planes near Tuscola.

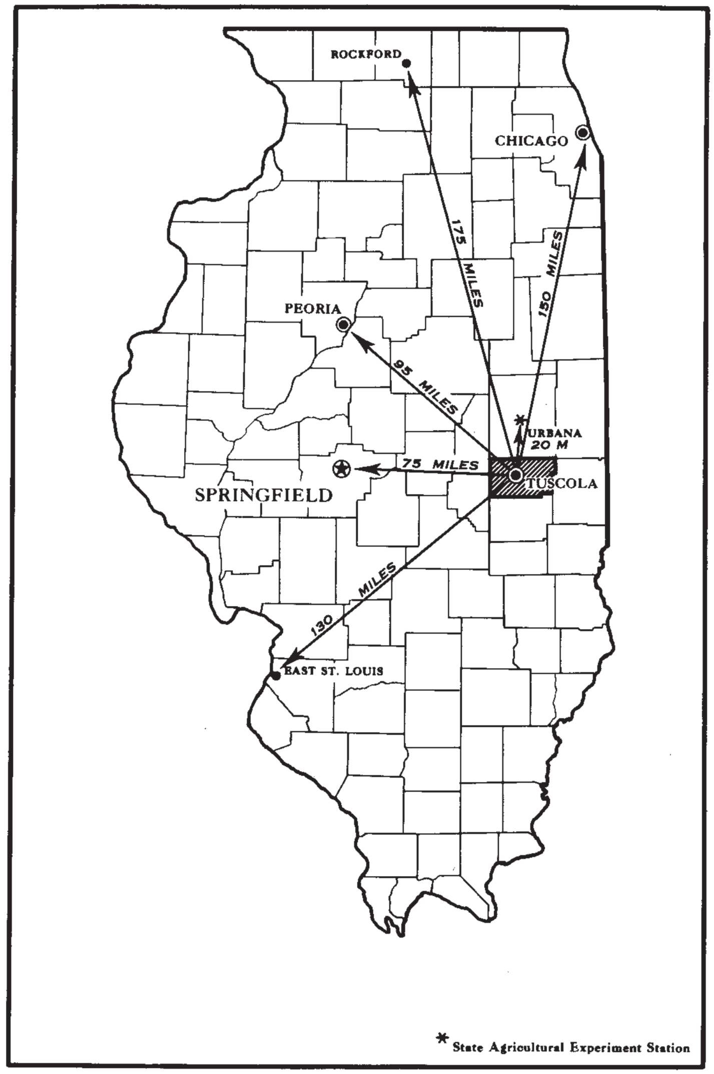


Figure 1.—**Location of Douglas County in Illinois.**

Natural resources and industry are important in the county. Oil and coal are major resources. In 1964 there were 105 oil wells that produced about 148,000

[1] Other soil scientists who contributed to the fieldwork are C. L. DOUGLAS and H. SMITH.

barrels (*19*).[2] One coal mine is operated in the county; it produces between 500,000 and 600,000 tons of coal annually (*3, 4*).

Several industries provide employment for residents of the county. The largest, which provides employment for 1,200 people, is a plant that produces polyethylene and other products. There are also plants that process silica, fabricate metal products, process broom corn and seed corn, and produce mixed fertilizer. In addition, there are two natural gas compression stations.

Sand and gravel deposits favorable for water supply generally are scattered throughout the county (*12*), but they occur more commonly in the northwestern and central parts. Wells are the main source of water.

Climate[3]

Douglas County has a continental climate typical of east-central Illinois. Table 1 gives temperature and precipitation data for the county.

During the period 1948 through 1965, the average daily temperature at the Tuscola Weather Station was 54° F. Summer temperatures of more than 100° were recorded during this period in each of the four months, June through September. The average daily maximum, however, was less than 90°, and only about one-third of the days had a maximum temperature as high as 90°. The highest temperature recorded was 113°. In every year but one during this period, the minimum temperature recorded was 0° or lower. The lowest recorded temperature was −19°, recorded in February 1951.

The average annual precipitation during the period 1948 through 1965 was 38.4 inches. It ranged from about 50 inches to about 29 inches.

Not all of the yearly supply of water is available for crop growth. Some flows into streams, some evaporates, and some percolates too deeply to be reached by plant roots. If adequate fertility is maintained and other good management practices are followed, the supply is generally adequate for a 5- to 10-year average production of about 140 bushels of corn or about 45 bushels of soybeans per acre on the best soils of the county.

Two-fifths of the average annual precipitation occurs as rainfall during the most critical growing period, May through August. This amount, however, is not adequate for maximum crop yields, unless it is supplemented by moisture stored in the soil. The probability of regularly receiving precipitation in the amount of 0.4 inch or more in any one-week period during these four months is slightly more than 50 percent. The probability of regularly receiving 1 inch or more in any two-week period is only 60 percent.

Periods of continuous high temperatures in summer generally do not last long, but occasionally hot dry spells persist long enough to cause crop damage and reduce yields.

Precipitation in summer occurs mostly as brief showers or as thunderstorms. A single thunderstorm often produces an inch or more of rain and occasionally is accompanied by hail and damaging winds. Hailstorms occur about once in 2 years in any given area. Not all hailstorms have stones of sufficient size or quantity to cause extensive crop damage.

In Douglas County the period between the last freezing temperature in spring and the first freezing temperature in fall is about 178 days. Not all crops, of course, are affected to the same degree by cold temperatures, but a growing season of about 178 days

[2] Italic numbers in parentheses refer to Literature Cited, page 79.
[3] WILLIAM L. DENMARK, State climatologist, ESSA, U.S. Weather Bureau, assisted in the preparation of this section.

TABLE 1.—*Temperature and precipitation data*

[Based on records, 1948–1965, at Tuscola. Elevation 653 feet]

Month	Temperature				Precipitation			
	Average daily maximum	Average daily minimum	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—	Average total[1]	One year in 10 will have— Less than—	One year in 10 will have— More than—	Average depth of snow on days with snow cover
	°F.	*°F.*	*°F.*	*°F.*	*Inches*	*Inches*	*Inches*	*Inches*
January	38	21	70	−14	2.3	0.8	3.4	3.5
February	42	24	71	−19	2.1	.8	3.6	4.1
March	50	29	81	−10	3.4	1.6	5.4	3.3
April	66	41	88	20	3.6	1.7	5.9	.1
May	77	51	95	29	4.2	1.8	7.4	0
June	85	61	105	40	4.7	1.7	7.8	0
July	89	65	113	45	3.1	1.0	4.9	0
August	87	63	102	43	3.5	1.3	5.7	0
September	71	55	102	34	3.3	1.0	6.0	0
October	70	44	93	18	3.1	1.0	5.9	0
November	52	31	82	−7	2.9	.9	4.7	1.6
December	41	23	70	−14	2.2	1.0	3.6	3.9
Year	64	42	113	−19	38.4	31.6	46.0	16.5

[1] Including all rainfall and melted snowfall. Normally, 10 inches of snow is the equivalent of 1 inch of water.

can be expected for corn, soybeans, and many vegetables.

Physiography, Relief, and Drainage[4]

All of Douglas County is in the Till Plains section of the Central Lowland Province. It is in the southern part of the Bloomington Ridged Plain, one of the seven subdivisions of the Till Plains section (*9*). In this area, more than in others, the grass-covered, rolling prairie and extensive swamps developed.

The relief is mainly level to gently sloping. The upper strata of bedrock have been modified by glaciation, when drift material about 20 to 100 feet thick was deposited on the bedrock. Most of the soils were partially formed from this material. The elevation ranges from about 600 feet where the Embarras River leaves the county, in the southeastern part, to about 720 feet on the ridge north of Newman, in the northeastern part. Most of the county is between 640 and 700 feet above sea level. A distinct geomorphological feature is a broad, shallow depression in the east-central part of the county. During Wisconsinan time (*6*) this area was occupied by a glacial lake that had a surface elevation of 650 feet. Later, the lake was drained, and the area is now intensively cultivated.

All of Douglas County is drained by surface streams. The eastern two-thirds of the county is in the Embarras River watershed. Jordan Slough, Scattering Fork, Brushy Fork, and Deer Creek are tributaries that flow into the river. The Embarras River is a tributary of the Wabash River, which empties into the Ohio River. The western third of the county is drained by the Kaskaskia River, which is part of the Mississippi River Basin. Both the Embarras and Kaskaskia Rivers are small in Douglas County.

Farming

Farming is the main enterprise in Douglas County. The soils are nearly level and are well suited to crops, and the climate is favorable. According to the 1964 Census of Agriculture, about 92 percent of the acreage is cultivated. The percentage of land in farms has remained fairly constant over the years. The number of farms is generally decreasing, but the size of farms is increasing. In 1964 there were 967 farms, and the average size was 259.5 acres.

Cash-grain is the principal type of farming, except in the southwestern part of the county, where grain-livestock is important. Corn and soybeans are the main crops. Wheat, oats, and hay are grown, but to a lesser extent. In 1964 corn and soybeans were grown on about 75 percent of the cropland, oats and wheat on about 11 percent, and hay on about 2 percent. The remaining 12 percent of the cropland, generally planted to clean-tilled crops, was diverted from crop production in 1964. Most of the hay is used for livestock.

Livestock raising is an important enterprise on some farms, mostly in the sloping areas or in the southwestern part of the county. In 1964 there were 16,255 head of cattle, 2,620 sheep, 25,238 hogs, and about 1,100 horses. The numbers of cattle, sheep, hogs, and horses have remained fairly constant over the past several years (fig. 2). The poultry industry is also important. In 1964 there were 68,287 chickens and 124,565 turkeys on farms of the county.

[4] H. L. WASCHER, associate professor of pedology, University of Illinois, assisted in the preparation of this section.

Figure 2.—**An area of Flanagan and Drummer soils. This area is in the southwestern part of the county.**

How This Soil Survey Was Made

This survey was made to learn what kinds of soils are in Douglas County, where they are located, and how they can be used. Soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* (*15*) and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Miami and Flanagan, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Miami silt loam, 4 to 7 percent slopes, eroded, is one of several phases within the Miami series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

The soil scientists set up trial groups of soils on the basis of yield and practice tables and other data they have collected. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Douglas County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, drainage, and other characteristics that affect their management.

The six soil associations in Douglas County are discussed in the following pages.

1. *Drummer-Flanagan association*

Poorly drained and somewhat poorly drained, level to gently sloping soils that formed in 3 to 5 feet of silty material and the underlying glacial till or outwash

This association (fig. 3) occurs throughout the county except in the central part. Most areas are nearly level. The association makes up about 52 percent of the county.

About 50 percent of this association consists of Drummer soils, and about 35 percent of Flanagan soils. About 10 percent consists of Elburn soils, and about 5 percent of Raub and Catlin soils.

Drummer, Flanagan, and Elburn soils formed mostly in silty material. The lower part of the subsoil of the Drummer and Elburn soils formed in outwash material, and the lower part of the Flanagan soils formed in glacial till.

Drummer, Flanagan, and Elburn soils are dark colored and moderately permeable. Their organic-matter content is high. Drummer soils are poorly drained. They have a surface layer and subsoil of silty clay loam. Flanagan and Elburn soils, which are somewhat poorly drained, have a surface layer of silt loam and a subsoil of silty clay loam.

Drummer soils and a few areas of Flanagan, Elburn, and Raub soils need artificial drainage. Erosion is a moderate hazard in the gently sloping areas. In some years soil blowing in spring is a hazard on fall-plowed areas of Drummer soils.

Raub soils are somewhat poorly drained. Catlin soils are well drained to moderately well drained.

Most farms are of the cash-grain type. Corn and soybeans are the main crops. Wheat and hay are grown to some extent, especially in the southwestern part of the county.

Farms in this association are generally somewhat larger than in other, more rolling associations. They are smaller than average, however, in the southwestern part of the county. Most of the homes and farmsteads are in areas of Flanagan or Elburn soils, rather than in areas of the wetter Drummer soils.

Roads follow section lines in most areas.

2. *Raub-Dana-Flanagan association*

Somewhat poorly drained and moderately well drained, nearly level to moderately sloping soils that formed in 1½ to 5 feet of silty material and the underlying loamy glacial till

This association occurs mainly in two parts of the county. One area, in the northeastern part, extends from near Camargo to the northeastern corner of the

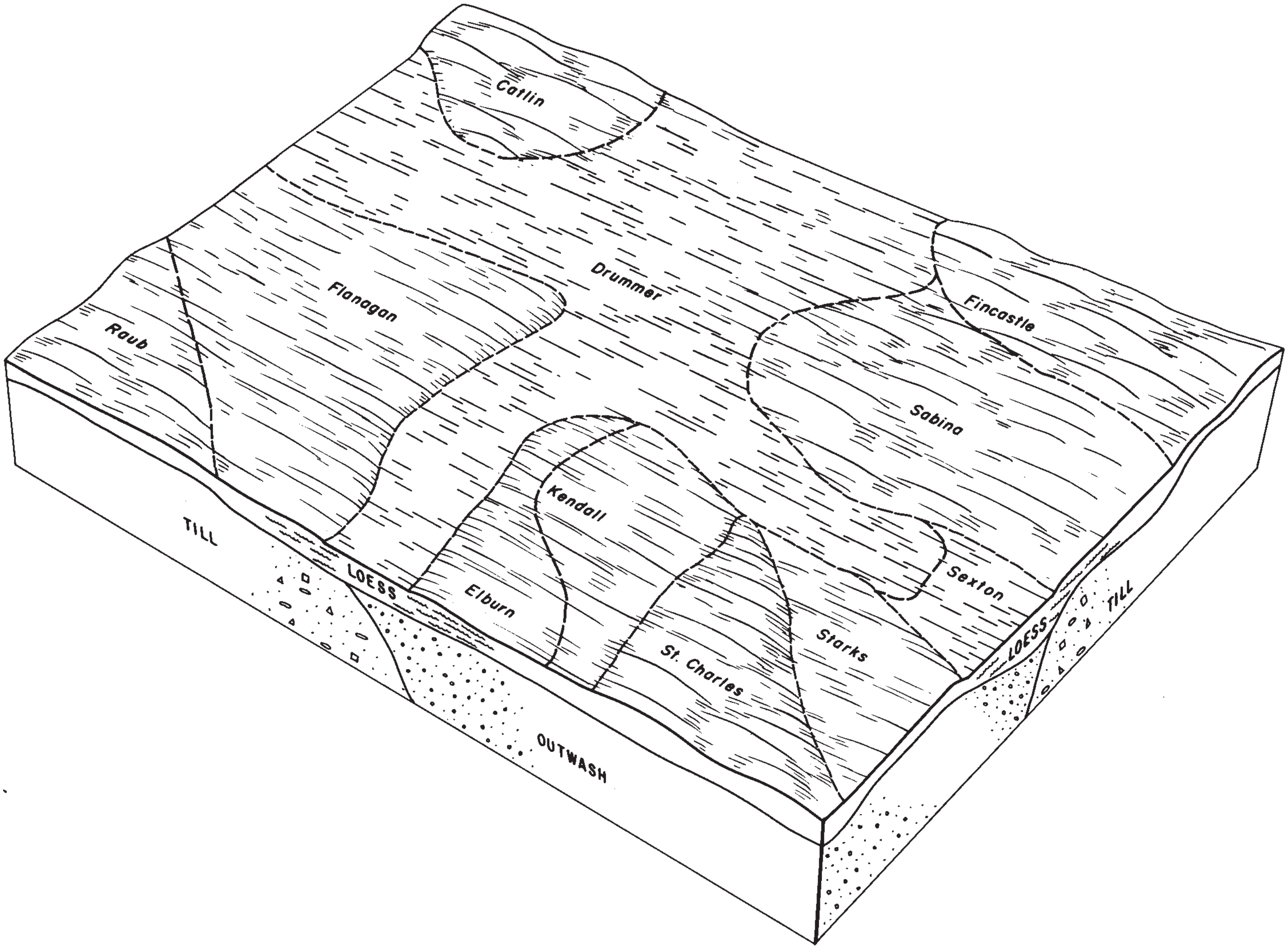


***Figure 3.*—Major soil series of associations 1 and 4, their pattern on the landscape, and their relationship to the parent material.**

county. The other is in the southeastern part, south and east of Hindsboro. Most areas are nearly level to moderately sloping and consist mainly of long ridges. This association makes up about 9 percent of the county.

About 50 percent of this association consists of Raub soils, about 20 percent of Dana soils, and about 20 percent of Flanagan soils. About 10 percent consists mainly of Catlin and Drummer soils.

Raub and Dana soils formed in silty material and glacial till. Flanagan soils formed mostly in silty material.

Raub and Flanagan soils are somewhat poorly drained, and Dana soils are moderately well drained. These soils have a surface layer of silt loam and a subsoil of silty clay loam. The lower part of the subsoil of the Raub and Dana soils is clay loam.

These soils are moderately to moderately slowly permeable. Their organic-matter content is high. Slopes are longer than average, but the soils are well suited to contouring and terracing that help control erosion.

Most farms are of the cash-grain type. The soils are well suited to crops, chiefly corn and soybeans. Small grains and meadow are also suitable. Most of the farmsteads are in areas of the better drained soils.

Roads follow section lines in most areas. Control of erosion is the main management problem.

3. Milford-Drummer-Flanagan association

Very poorly drained to somewhat poorly drained, nearly level soils that formed in $2\frac{1}{2}$ to 5 feet of silty material and the underlying lakebed or outwash material

This association occupies much of the south-central and east-central parts of the county, from Tuscola and Arcola on the western side and extending in a northeasterly direction to the Edgar County line. This is a

Figure 4.—**An area of the nearly level Milford–Drummer–Flannagan association. Corn is one of the main crops.**

former glacial lakebed characterized by very little change in elevation over long distances (fig. 4). This association makes up about 21 percent of the county.

About 50 percent of this association consists of Milford soils, 25 percent of Drummer soils, and 15 percent of Flanagan soils. About 10 percent consists mainly of Brenton and Rutland soils.

Milford soils are poorly drained to very poorly drained, and Drummer soils are poorly drained. Milford soils have a surface layer and subsoil of heavy silty clay loam or silty clay. Drummer soils have a surface layer and subsoil of silty clay loam. Flanagan soils are somewhat poorly drained. They have a surface layer of silt loam and a subsoil of heavy silty clay loam and silty clay.

Milford and Drummer soils are wet unless they have been artificially drained, and some areas of Flanagan soils need artificial drainage. Milford soils are moderately slowly permeable or slowly permeable, and Drummer and Flanagan soils are moderately permeable. Tile drainage is effective on the Drummer and Flanagan soils. Under good management tile drainage on Milford soils is adequate where excess surface water is removed by shallow surface drains. This area has very few natural drainage channels. Deep ditches have been dug to supply outlets for tile lines and surface drains. Milford and Drummer soils dry out slowly in spring.

Most farms are of the cash-grain type. Corn and soybeans are the main crops. Small grains, legumes, and grasses are also suitable, but they are grown to a lesser extent. The size of farms in this association is about average for the county. Most of the farmsteads are in areas of Flanagan soils, rather than in areas of the wetter, lower lying Milford and Drummer soils.

Most roads follow section lines. Providing drainage is the main management problem.

4. Sabina-Drummer association

Somewhat poorly drained and poorly drained, nearly level to gently sloping soils that formed in 3 to 5 feet of silty material and the underlying glacial till or outwash material

This association (see fig. 3) consists of many areas near and parallel to the Embarras and Kaskaskia Rivers and their major tributaries. The areas are transitional between the wide expanses of dark-colored soils and the sloping, light-colored soils bordering the streams. The topography is nearly level to gently sloping. The somewhat poorly drained soils are in the slightly elevated positions, and the poorly drained soils are in the lower lying areas. This association makes up about 8 percent of the county.

About 50 percent of this association consists of Sabina soils, and 30 percent of Drummer soils (fig. 5). About 20 percent consists mainly of Kendall, Starks, Fincastle, Sexton, and St. Charles soils.

Sabina soils are light colored, somewhat poorly drained, and moderately permeable to moderately slowly permeable. Their organic-matter content is low. They have a surface layer of silt loam and a subsoil of silty clay loam. Drummer soils are dark colored, poorly drained, and moderately permeable. Their organic-matter content is high. They have a surface layer and subsoil of silty clay loam.

Figure 5.—An area of the Sabina-Drummer association. Sabina and Kendall soils occupy slightly higher positions than Drummer soils.

Some areas of Kendall, Sabina, Fincastle, and Starks soils need artificial drainage. The surface layer of these soils tends to clod because of the low organic-matter content. Tile drains used in combination with shallow surface drains provide adequate drainage. The surface layer of Drummer soils tends to clod if tilled when wet. Tile drains, alone, are effective in these soils.

The soils of this association are well suited to crops, chiefly corn and soybeans. Most farms are of the cash-grain type. More small grains, grasses, and legumes are grown and more livestock is raised in this association than in associations 1, 2, and 3.

The size of farms in this association is about average for the county. Most of the farmsteads are in areas of the better drained soils.

Roads are not so straight as those in associations 1, 2, and 3. Most do not follow section lines.

5. *Starks-Camden association*

Somewhat poorly drained to well-drained, nearly level to moderately sloping soils that formed in less than 3 feet of silty material and the underlying outwash material

This association (fig. 6) consists of five small areas in the county. The area south of Camargo and the one north of Villa Grove are nearly level to gently sloping. The area bordering Brushy Fork, near Newman, and the two small areas in the southeastern part of the county are nearly level to moderately sloping. This association makes up about 2 percent of the county.

About 50 percent of this association consists of Starks soils, and 30 percent of Camden soils. About 20 percent consists mainly of Drummer, Sexton, and Millbrook soils.

Starks soils are somewhat poorly drained and moderately permeable to moderately slowly permeable. Camden soils are well drained and moderately permeable. Both soils are light colored, and both have a surface layer of silt loam and a subsoil of clay loam or silty clay loam. Their organic-matter content is low. The underlying material is stratified loamy and sandy glacial outwash.

Artificial drainage is needed in some areas of Starks soils. Control of erosion is necessary on the sloping areas of Camden soils.

Most farms in the area south of Camargo are of

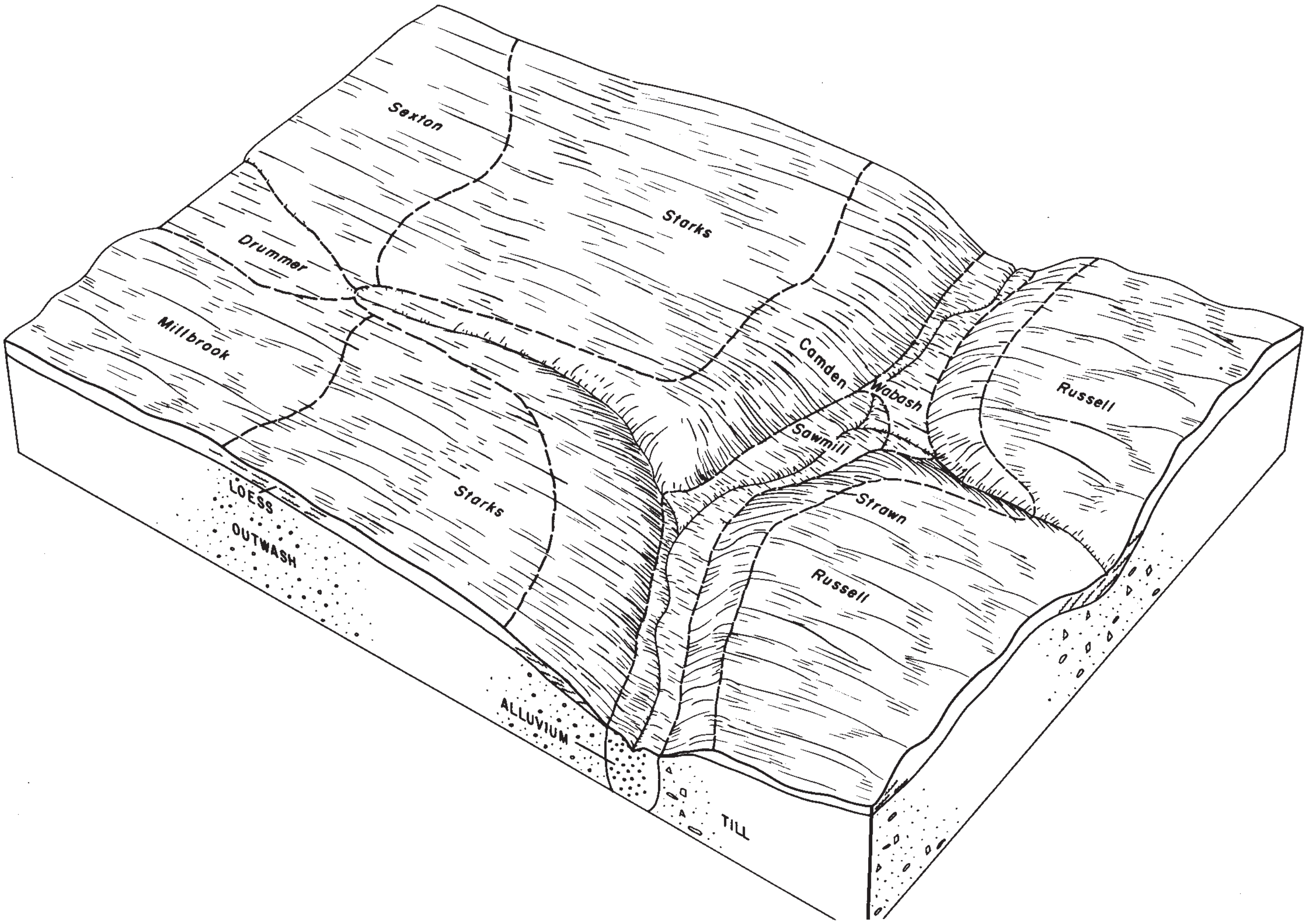


Figure 6.—**Major soils of associations 5 and 6, their pattern on the landscape, and their relationship to the parent material.**

the cash-grain type. In other areas they are a combination of the cash-grain and livestock type. Corn and soybeans are the main crops. Small grains, legumes, and grasses are also suitable. Many of the moderately sloping areas of Camden soils are in permanent pasture or woodland. Farms in this association are slightly smaller than average.

The sandy underlying material throughout this association severely limits the use of the soils for pond reservoirs. Excessive seepage is likely.

6. *Russell-Camden-Sawmill association*

Well-drained, sloping soils that formed in less than 3 feet of loess and in underlying glacial till or outwash, and adjacent poorly drained and very poorly drained bottom-land soils

Most of this association (see fig. 6) is parallel to the major streams. The association consists of moderately sloping to steep Russell and Camden soils on valley walls on both sides of nearly level Sawmill soils, which border streams. The association makes up about 8 percent of the county.

About 30 percent of this association consists of Russell soils, 25 percent of Camden soils, and 25 percent of Sawmill soils (fig. 7). About 20 percent consists mainly of Wabash, Strawn, and Starks soils.

Russell and Camden soils are well drained. They have a surface layer of light-colored silt loam and a subsoil of silty clay loam to clay loam. Sawmill soils are poorly drained and very poorly drained. They are dark colored and have a texture of silty clay loam.

Russell and Camden soils are moderately permeable, and their organic-matter content is low. Sawmill soils are moderately permeable to a depth of 30 inches, and their organic-matter content is high.

Erosion is a hazard on cultivated areas of Russell

***Figure 7.*—An area of moderately sloping and strongly sloping Russell soils and nearly level Sawmill soils.**

and Camden soils. Sawmill soils are wet and are subject to flooding.

The moderately steep to steep areas are suited to permanent pasture or woodland. The moderately sloping and strongly sloping areas are suited to crops if erosion is controlled.

Most farms are of the combination livestock and grain type. Corn, soybeans, oats, wheat, legumes, and grasses are the main crops. Where protected from flooding, the nearly level bottom-land soils are suited to corn and soybeans. Bottom-land soils not protected from flooding are suited to permanent pasture. Most of the woodland of the county is in this association, as well as most of the permanent pasture.

Farms in this association are smaller than in other associations, and there are few farmsteads. Sawmill and Wabash soils provide poor homesites.

There are fewer roads in this association than in the others.

Descriptions of the Soils

This section describes the soil series and mapping units of Douglas County. The approximate acreage and proportionate extent of the soils are given in table 2.

In the pages that follow, a general description of each soil series is given. Each series description has a short narrative description of a typical profile and a much more detailed description of the same profile, from which highly technical interpretations can be made. Following the profile is a brief statement of the range in characteristics of the soils in the series, as mapped in Douglas County. Color names and color symbols are for a moist soil, unless otherwise indicated.

Following the series description, each mapping unit in the series is described individually. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit.

After the name of each mapping unit there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. At the end of the description of each mapping unit is listed the management group in which the mapping unit has been placed. The pages where these groups are described can be readily learned by referring to the "Guide to Mapping Units."

For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. Many of the terms used in the soil descriptions and other parts of the survey are defined in the Glossary.

TABLE 2.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Alvin fine sandy loam, 2 to 4 percent slopes	66	(1)
Brenton silt loam	4,678	1.7
Brooklyn silt loam	845	.3
Camden silt loam, 0 to 2 percent slopes	278	.1
Camden silt loam, 2 to 4 percent slopes	1,254	.5
Camden silt loam, 4 to 7 percent slopes, eroded	507	.2
Camden silt loam, 7 to 12 percent slopes, eroded	442	.2
Camden soils, 7 to 25 percent slopes, severely eroded	280	.1
Catlin silt loam, 2 to 4 percent slopes	445	.2
Dana silt loam, 2 to 4 percent slopes	2,098	.8
Drummer silt loam, overwash	393	.1
Drummer silty clay loam	110,203	41.0
Elburn silt loam, 0 to 2 percent slopes	11,989	4.5
Elburn silt loam, 2 to 4 percent slopes	561	.2
Fincastle silt loam, 0 to 2 percent slopes	1,257	.5
Fincastle silt loam, 2 to 4 percent slopes	1,158	.4
Flanagan silt loam, 0 to 2 percent slopes	55,704	20.7
Flanagan silt loam, 2 to 4 percent slopes	3,940	1.4
Harpster silty clay loam	659	.2
Harvard silt loam, 1 to 4 percent slopes	295	.1
Harvard silt loam, 4 to 7 percent slopes, eroded	170	.1
Kendall silt loam	1,412	.5
Kernan silt loam, 0 to 2 percent slopes	738	.3
Kernan silt loam, 2 to 4 percent slopes	576	.2
Lawson silt loam	766	.3
Miami silt loam, 4 to 7 percent slopes, eroded	428	.2
Miami silt loam, 7 to 12 percent slopes, eroded	494	.2
Miami soils, 4 to 7 percent slopes, severely eroded	452	.2
Miami soils, 7 to 12 percent slopes, severely eroded	466	.2
Milford silty clay loam	28,880	10.7
Millbrook silt loam	1,570	.6
Montmorenci silt loam, 4 to 7 percent slopes, eroded	906	.3
Nappanee soils, 5 to 12 percent slopes, severely eroded	179	.1
Pella silty clay loam	1,027	.4
Peotone silty clay loam	683	.3
Plano silt loam, 1 to 4 percent slopes	342	.1
Proctor silt loam, 1 to 4 percent slopes	831	.3
Raub silt loam, 0 to 2 percent slopes	3,309	1.2
Raub silt loam, 2 to 4 percent slopes	1,830	.7
Ridgeville fine sandy loam	98	(1)
Russell silt loam, 4 to 7 percent slopes, eroded	1,130	.4
Russell silt loam, 7 to 12 percent slopes, eroded	132	.1
Russell soils, 4 to 7 percent slopes, severely eroded	175	.1
Rutland silt loam, 0 to 2 percent slopes	1,433	.5
Rutland silt loam, 2 to 4 percent slopes	415	.2
Sabina silt loam, 0 to 2 percent slopes	3,540	1.3
Sabina silt loam, 2 to 4 percent slopes	499	.2
St. Charles silt loam, 1 to 4 percent slopes	620	.2
Sawmill silty clay loam	1,073	.4
Sawmill silty clay loam, wet	5,788	2.2
Sexton silt loam	588	.2
Starks silt loam	2,309	.9
Strawn silt loam, 12 to 18 percent slopes, eroded	375	.1
Strawn silt loam, 18 to 40 percent slopes, eroded	1,164	.4
Sunbury silt loam, 0 to 2 percent slopes	2,840	1.1
Sunbury silt loam, 2 to 4 percent slopes	344	.1
Toronto silt loam, 0 to 2 percent slopes	677	.3
Toronto silt loam, 2 to 4 percent slopes	471	.2
Wabash silty clay, wet	520	.2
Xenia silt loam, 2 to 4 percent slopes	1,718	.6
Gravel pits	21	(1)
Borrow pits	23	(1)
Mine dump	25	(1)
Made land	62	(1)
Escarpments	15	(1)
Water	38	(1)
Industrial areas	596	.2
Total	268,800	100.0

[1] Less than 0.1 percent.

Alvin Series

This series consists of deep, gently sloping, moderately well drained to well drained soils, mainly along the Embarras River. These soils formed in moderately coarse textured material overlying coarse-textured outwash.

In a typical profile the surface layer is dark-brown fine sandy loam about 8 inches thick.

The subsoil, about 30 inches thick, is mainly dark yellowish-brown, firm sandy clay loam to sandy loam. It is dark brown and friable in the lower part.

The underlying material is dark yellowish-brown, loose loamy sand in which there are thin layers of strong-brown sandy loam.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate. The organic-matter content is low. The content of phosphorus and potassium is low to medium. The soils are medium acid to neutral.

Most areas are cultivated. Corn and soybeans are the main crops, but all the commonly grown crops are suited. Artificial drainage is not needed. Uncleared areas are used for woodland or pasture.

Typical profile of Alvin fine sandy loam, 2 to 4 percent slopes, in a cultivated field, 480 feet south and 80 feet east of the NW. corner of NE¼NE¼ sec. 19, T. 15 N., R. 10 E.

Ap—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; structureless to weak, fine, crumb structure; friable; plentiful roots; neutral; abrupt, smooth boundary.

B1t—8 to 13 inches, dark yellowish-brown (10 YR 4/4) heavy sandy loam to light sandy clay loam; moderate, medium, subangular blocky structure; firm; few roots; medium acid; clear, smooth boundary.

B21t—13 to 20 inches, dark yellowish-brown (10YR 4/4) light sandy clay loam; moderate to strong, medium, subangular blocky structure; thin brown (10YR 4/3) clay films; firm; medium acid; clear, smooth boundary.

B22t—20 to 29 inches, dark yellowish-brown (10YR 4/4) heavy sandy loam to light sandy clay loam; moderate, medium, subangular blocky structure; patchy brown (10YR 4/3) clay films; friable; medium acid; clear, smooth boundary.

B3t—29 to 38 inches, dark-brown (7.5YR 3/2) heavy sandy loam; moderate to strong, medium and coarse, subangular blocky structure; friable; no roots; clay coatings on sand grains but not ped faces; medium acid; clear, smooth boundary.

C—38 to 60 inches, dark yellowish-brown (10YR 4/4) loamy sand; lenses of brown (7.5YR 4/4) sandy loam; single grain; loose; no roots; medium acid.

The A horizon ranges from 6 to 14 inches in thickness, from fine sandy loam to sandy loam in texture, and from dark brown or very dark grayish brown to brown in color. It is slightly acid to neutral. The B horizon is sandy loam to light sandy clay loam in texture and dark yellowish brown to yellowish brown in color. In some areas the lower part of the subsoil is mottled. The solum ranges from 36 to 50 inches in thickness. The C horizon is loamy sand to sand. In many places it contains lenses of sandy loam.

Alvin soils contain more sand throughout the solum than Camden soils.

Alvin fine sandy loam, 2 to 4 percent slopes (131B).—This soil is on ridges or narrow breaks along the Embarras River. Included in mapping were small areas where the slope is less than 2 percent. The erosion hazard is moderate.

This soil is suited to crops and has only moderate limitations. Droughtiness and low fertility are major management problems. Control of wind and water erosion and maintenance of organic-matter content are minor problems. (Management group IIe–2)

Brenton Series

This series consists of deep, nearly level to level, somewhat poorly drained soils. These soils occur as small, widely scattered areas throughout the county, mainly in the lakebed areas. They formed in thin deposits of loess and the underlying sandy loam, loam, or silt loam outwash.

In a typical profile the surface layer is very dark brown to black silt loam. It is about 12 inches thick.

The subsoil is about 36 inches thick. In sequence from the top, it is grayish-brown, firm silty clay loam to a depth of 28 inches; mixed grayish-brown and yellowish-brown, firm silty clay loam to a depth of 40 inches; and mixed grayish-brown and yellowish-brown, friable heavy silt loam to a depth of 48 inches.

The underlying material is mixed dark-gray and yellowish-brown, friable loam.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is very high. The content of potassium is naturally medium to high. The soils are medium acid to slightly acid.

Most areas are cultivated. All the commonly grown crops are suited. Some areas are too wet in spring for cultivation unless they are drained. A few areas are used for pasture.

Typical profile of Brenton silt loam (0 to 3 percent slopes) in a cultivated field. 50 feet west of the NE. corner of SE¼SE¼ sec. 35, T. 15 N., R. 8 E.

Ap—0 to 6 inches, very dark brown (10YR 2/2) silt loam; moderate, fine and medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A1—6 to 10 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

A3—10 to 12 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—12 to 14 inches, dark grayish-brown (10YR 4/2) light silty clay loam; moderate, fine, subangular blocky structure; friable to firm; some very dark brown (10YR 2/2) coatings and material in filled channels; medium acid; clear, smooth boundary.

B21t—14 to 28 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; firm; some iron-manganese concretions; medium acid; gradual, smooth boundary.

IIB22t—28 to 40 inches, mixed grayish-brown (2.5Y 5/2, 30 percent), dark-gray (5Y 4/1, 40 percent), and yellowish-brown (10YR 5/6, 30 percent) silty clay loam; weak, medium, subangular blocky structure; firm; some iron-manganese concretions and sand grains; slightly acid; gradual, smooth boundary.

IIB3—40 to 48 inches, mixed grayish-brown (2.5Y 5/2) and yellowish-brown (10YR 5/8) heavy silt loam; weak, coarse, subangular blocky structure; friable; some sand grains; mildly alkaline; gradual, smooth boundary.

IIC—48 to 60 inches, mixed dark-gray (5Y 4/1, 70 percent) and yellowish-brown (10YR 5/4, 30 percent) loam; massive; friable; mildly alkaline.

The A horizon ranges from black to very dark grayish brown. It is 10 to 17 inches thick. The B2 horizon is silty clay loam and clay loam mottled with grayish brown to yellowish brown. The solum ranges from 35 to 55 inches in thickness. The C horizon is sandy loam, silt loam, or loam. In some places it is stratified.

Brenton soils are better drained than Drummer soils, but they are not so well drained as Proctor soils. They lack an A2 horizon, a layer which is characteristic of Millbrook soils. Brenton soils contain less sand than Ridgeville soils but slightly more sand at depths between 30 and 40 inches than Elburn soils.

Brenton silt loam (149).—This soil occupies irregularly shaped areas near streams or in the lakebed areas. Included in mapping were a few small areas where calcareous glacial till or loamy sand occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops and pasture. Wetness in nearly level areas or a slight erosion hazard on slopes of 2 to 3 percent are minor problems in some places. (Management group I–2)

Brooklyn Series

This series consists of deep, level to nearly level, poorly drained soils. These soils are widely scattered throughout the county. They occur at the head of drainageways, in slight depressions, and at the base of more sloping areas. They formed in thin deposits of loess and the underlying outwash, glacial till, or lakebed sediments. The topography is level to undulating.

In a typical profile the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer, about 10 inches thick, is grayish-brown silt loam mottled with yellowish brown.

The subsoil is about 34 inches thick. In sequence from the top, it is olive-gray, firm, heavy silty clay loam to silty clay, mottled with strong brown, to a depth of 44 inches; dark grayish-brown, firm gravelly clay loam, mottled with strong brown, to a depth of 51 inches; and mixed dark-brown and brown, friable to firm gravelly sandy loam to sandy clay loam below that depth.

Permeability is slow, and the available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is medium to high. The water table is at or near the surface most of the year. The soils are strongly acid to slightly acid.

Most areas are cultivated. If adequately drained, these soils are suited to all the commonly grown crops. A few areas are used for pasture.

Typical profile of Brooklyn silt loam, in a cultivated field, 200 feet east and 25 feet south of the NW. corner of SE¼NW¼ sec. 8, T. 16 N., R. 14 W.

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam; weak to moderate, fine and medium, granular structure; friable; abundant roots; neutral; abrupt, smooth boundary.

A2—7 to 17 inches, grayish-brown (2.5Y 5/2) silt loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, platy structure breaking to moderate, medium, granular; friable; plentiful roots; strongly acid; clear, smooth boundary.

B21tg—17 to 28 inches, olive-gray (5Y 4/2, 70 percent) heavy silty clay loam to light silty clay; many, coarse, prominent mottles of strong brown (7.5YR 5/6, 30 percent); weak, medium and coarse, prismatic structure breaking to moderate, medium and coarse, subangular and angular blocky; firm; few roots; thick, continuous, dark-gray (10YR 4/1) and very dark gray (10YR 3/1) clay films; some grayish-brown (2.5Y 5/2) silica coatings; strongly acid; gradual, smooth boundary.

B22tg—28 to 44 inches, olive-gray (5Y 4/2, 50 percent) heavy silty clay loam to light silty clay; many, coarse, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to moderate, coarse, subangular and angular blocky; firm; few roots; medium, continuous, dark-gray (10YR 4/1) clay films; medium acid; abrupt, smooth boundary.

IIB31—44 to 51 inches, dark grayish-brown (10YR 4/2) gravelly clay loam; many, medium, faint mottles of dark yellowish brown (10YR 4/4); weak, coarse, subangular blocky structure; thin, dark-gray (10-YR 4/1) clay films; firm; few roots; mildly alkaline; abrupt, smooth boundary.

IIB32—51 to 60 inches, mixed dark-brown (10YR 3/3) and brown (10YR 4/3) gravelly sandy loam to sandy clay loam; weak, coarse, blocky structure to massive; friable to firm; mildly alkaline.

The A horizon ranges from 14 to 20 inches in thickness. The Ap horizon is very dark brown to very dark grayish brown. The A2 horizon is grayish brown to light brownish gray. In most areas the B2 horizon is olive gray to gray in the upper part and olive gray to dark yellowish brown in the lower part. It is mottled throughout with strong brown to dark grayish brown. The solum ranges from 45 to more than 60 inches in thickness. In most areas the C horizon, at a depth greater than that of the lowest layer described in the typical profile, is sandy.

Brooklyn soils have a darker colored surface layer than Sexton soils. They are more poorly drained than Millbrook or Sunbury soils.

Brooklyn silt loam (136).—This soil occupies small circular depressions or areas at the head of drainageways or at the base of slopes. Included in mapping were a few areas that have a silty clay subsoil.

Surface runoff is very slow, and there is no erosion hazard. Internal drainage is slow.

This soil is suited to crops and pasture. The most serious management problem is providing adequate surface drainage. (Management group IIw-3)

Camden Series

This series consists of deep, well-drained soils. Most areas are near the Embarras River and its main tributaries. The soils are level to moderately steep. In some areas they are uneroded, but in others they are moderately to severely eroded. They formed in thin deposits of loess and the underlying sandy loam, loam, or silt loam outwash.

In a typical profile the surface layer is very dark grayish-brown silt loam about 3 inches thick. The subsurface layer, about 8 inches thick, consists of brown silt loam. In cultivated areas tillage has brought the upper 4 inches of the subsurface layer into the surface layer, and in these places the plow layer is dark grayish brown.

The subsoil, about 37 inches thick, is mainly dark yellowish brown. It is firm silty clay loam in the upper part, firm clay loam in the middle part, and friable sandy clay loam in the lower part.

The underlying material is yellowish-brown and light olive-brown sandy loam. It consists of friable, stratified outwash.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are slightly acid to medium acid.

Most of the level to moderately sloping areas are cultivated. All the commonly grown crops are suited. Regular fertilization and erosion control, especially in the more sloping areas, are important. Artificial drainage is not needed. Some of the strongly sloping and moderately steep areas are used for pasture.

Typical profile of Camden silt loam, 2 to 4 percent slopes, in a virgin area, 300 feet north and 375 feet east of the SW. corner of NE¼SE¼ sec. 22, T. 16 N., R.9E.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure;

friable; abundant roots; neutral; clear, smooth boundary.

A2—3 to 11 inches, brown (10YR 4/3) silt loam; weak, thick, platy structure breaking to weak, medium and coarse, granular; friable; plentiful roots; few iron-manganese concretions; slightly acid; clear, smooth boundary.

B1—11 to 14 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; weak, fine and medium, subangular blocky structure; friable to firm; plentiful roots; few dark-brown (10YR 4/3) coatings on ped faces; medium acid; gradual, smooth boundary.

B21t—14 to 28 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few roots; dark-brown (10YR 4/3) clay films; slightly acid; gradual, smooth boundary.

IIB22t—28 to 39 inches, mixed, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) clay loam; moderate, coarse, subangular blocky structure; firm; few roots; few dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; medium acid; clear, smooth boundary.

IIB3–39 to 48 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; many, coarse, faint mottles of yellowish brown (10YR 5/6, 30 percent); weak, coarse, subangular blocky structure; friable; few roots; few iron-manganese concretions; slightly acid; abrupt, smooth boundary.

IIC—48 to 60 inches, mixed yellowish-brown (10YR 5/4) and light olive-brown (2.5Y 5/4) stratified sandy loam; massive; friable; no roots; few iron-manganese concretions; slightly acid.

In plowed areas the surface layer ranges from dark grayish brown to dark brown. The A2 horizon is dark grayish brown to brown. The A horizon ranges from 8 to 15 inches in thickness. The B horizon is silty clay loam to clay loam in the upper part and clay loam to sandy clay loam in the lower part. The solum ranges from 35 to 55 inches in thickness. The IIC horizon is sandy loam, loam, or sandy clay loam.

Camden soils are better drained than Starks soils. They have a thinner A1 horizon than Harvard soils. They contain less sand in the solum than Alvin soils and more sand at depths between 30 and 40 inches than St. Charles soils.

Camden silt loam, 0 to 2 percent slopes (134A).—This soil occupies small areas near the Embarras River. Included in mapping were a few small areas where loamy sand occurs in the lower part of the subsoil. The included areas make up less than 3 percent of the acreage.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops. It is also suitable for pasture and woodland. Maintenance of tilth is a minor problem. (Management group I–1)

Camden silt loam, 2 to 4 percent slopes (134B).—This soil occupies small, irregularly shaped areas near the Embarras River. It has the profile described as typical of the series. Included in mapping were a few small areas where loamy sand occurs in the lower part of the subsoil. Also included was a small acreage of eroded soils. The included areas make up less than 6 percent of the acreage.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops, pasture, and woodland. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IIe–2)

Camden silt loam, 4 to 7 percent slopes, eroded (134C2).—Many areas of this soil are near the Embarras River where the topography is moderately sloping or on breaks toward drainageways where the topography is undulating. The profile of this soil is similar to that described as typical of the series, except that the plow layer is a mixture of the surface layer, the subsurface material, and some of the subsoil. Included in mapping were a few small areas where loamy sand occurs in the lower part of the subsoil or where silty clay and clay occur at a depth below 40 inches.

Surface runoff is rapid, and the erosion hazard is moderate.

This soil is well suited to crops. It is also suitable for pasture and woodland. Control of erosion is a necessary part of management. Maintenance of tilth is a minor problem. (Management group IIe–2)

Camden silt loam, 7 to 12 percent slopes, eroded (134D2).—Most areas of this soil occur near the Embarras River. They are on breaks to drainageways and bottom lands. The profile of this soil is similar to that described as typical of the series, except that the surface and subsurface layers are thin. In cultivated areas, the plow layer is a mixture of the surface layer, subsurface material, and some of the subsoil. Included in mapping were a few areas where the plow layer consists mostly of subsoil material. Also included were a few areas where loamy sand occurs in the lower part of the subsoil.

Surface runoff is rapid, and the erosion hazard is severe.

This soil is suited to crops, pasture, and woodland. Control of erosion is a necessary part of management. Maintenance of tilth is a minor problem. (Management group IIIe–1)

Camden soils, 7 to 25 percent slopes, severely eroded (134D3).—Most of these areas occur near the Embarras River. They are on breaks to drainageways and bottom lands. The profile is similar to that described for the series, except that the surface layer and subsurface layer are less than 3 inches thick, and, in cultivated areas, the plow layer consists mostly of subsoil material, which is light or medium silty clay loam. Also, the combined thickness of the surface layer and subsoil is about 35 to 40 inches.

Included in mapping were a few small areas where loamy sand occurs in the lower part of the subsoil. These areas make up less than 6 percent of the acreage. Also included was a small acreage where silty clay or clay occurs at a depth below 40 inches. In addition, areas were included where the slope is outside the range of 7 to 25 percent and the soil is less eroded.

Surface runoff is very rapid, and the erosion hazard is very severe.

These soils are suited to pasture and hay and to woodland. Small areas can be used for corn or soybeans if erosion is adequately controlled. The most serious management problem is control of erosion and maintenance of tilth. (Management group IVe–1)

Catlin Series

This series consists of deep, gently sloping, moderately well drained to well drained soils. These soils are in areas of undulating topography, near soils that are not so well drained. They formed in mostly moderately thick deposits of loess but partly in the underlying glacial till.

In a typical profile the surface layer is very dark gray to very dark grayish-brown silt loam about 12 inches thick.

The subsoil, about 40 inches thick, is mainly firm silty clay loam. The upper part, to a depth of about 27 inches, is dark brown to dark yellowish brown. The lower part, to a depth of about 52 inches, is yellowish brown mottled with grayish brown and light olive brown. The lower few inches of the subsoil is clay loam.

The underlying material is light olive-brown loam mottled with gray. It consists of friable, calcareous glacial till.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is very high, and the content of phosphorus and potassium is high. The soils are slightly acid to medium acid.

Most areas are cultivated. All the commonly grown crops are well suited. Artificial drainage is not needed. These soils are also well suited to pasture.

Typical profile of Catlin silt loam, 2 to 4 percent slopes, in a virgin area, 15 feet north of the SE. corner of SW¼ sec. 5, T. 16 N., R. 14 W.

A1—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, granular structure; friable; abundant roots; slightly acid; clear, smooth boundary.

A3—9 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; medium acid; clear, smooth boundary.

B1—12 to 15 inches, dark-brown (10YR 4/3) light silty clay loam; moderate, very fine, subangular blocky structure; friable; plentiful roots; continuous, very dark gray (10YR 3/1) organic films; medium acid; clear, smooth boundary.

B21t—15 to 21 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; thin, continuous, dark-brown (10YR 4/3) clay films; medium acid; clear, smooth boundary.

B22t—21 to 27 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; thin, continuous, dark-brown (10YR 4/3) clay films; medium acid; gradual, smooth boundary.

B23t—27 to 38 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, faint mottles of grayish brown (10YR 5/2); weak, medium and coarse, angular blocky structure breaking readily to moderate, medium, subangular blocky; firm; few roots; moderately thick, continuous, dark-brown (10YR 4/3) clay films; few soft iron-manganese concretions; medium acid; clear, smooth boundary.

B31—38 to 42 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, faint mottles of light olive brown (2.5Y 5/6); weak, coarse, subangular blocky structure; firm; no roots; thin, discontinuous, dark-brown (10YR 4/3) clay films; few soft iron-manganese concretions; neutral; clear, smooth boundary.

IIB32—42 to 52 inches, yellowish-brown (10YR 5/4) light silty clay loam; some grit; common, fine, faint mottles of light olive brown (2.5Y 5/6); weak, coarse, subangular blocky structure; firm; no roots; moderately thick, discontinuous, very dark grayish-brown (10YR 3/2) clay films; few soft iron-manganese concretions; few small pebbles; neutral; clear, smooth boundary.

IIC—52 to 60 inches, mixed light olive-brown (2.5Y 5/4) and grayish-brown (10YR 5/2) heavy silt loam; some grit; massive; friable; few small pebbles; calcareous till.

The A horizon ranges from very dark brown to very dark grayish brown in color and from 8 to 16 inches in thickness. In most areas the B horizon is dark yellowish brown, yellowish brown, light olive brown, or dark brown. In some areas the lower part of the B horizon is not mottled. The solum ranges from 40 to 55 inches in thickness. The B horizon formed mostly in loess, but some of the lower part formed in till.

Catlin soils are better drained than Flanagan soils. They contain less sand in the lower part of the subsoil than Plano and Dana soils.

Catlin silt loam, 2 to 4 percent slopes (171B).—This soil occupies small, irregularly shaped areas on small breaks or side slopes. In some areas a thin layer of stratified sandy loam or loam outwash, as much as 10 inches thick, occurs between the loess and the till.

Surface runoff is medium, and the erosion hazard is moderate.

Most areas are used for crops. The soil is also suitable for pasture. Control of erosion is a necessary part of good management. (Management group IIe–1)

Dana Series

This series consists of deep, moderately well drained soils. Most areas are in the southeastern part of the county and on the ridge north of Murdock and Newman, where the topography is undulating or gently rolling. These soils formed in thin deposits of loess and the underlying glacial till.

In a typical profile the surface layer is very dark brown silt loam about 11 inches thick.

The subsoil is about 38 inches thick. The upper part is mainly dark-brown, firm silty clay loam, and the lower part is dark-brown, firm clay loam mottled with very dark gray to yellowish brown.

The underlying material is light olive-brown loam mottled with olive yellow and dark gray. It consists of friable, calcareous glacial till.

Permeability is moderate, and the available moisture capacity is high. The content of phosphorus is low, and the content of potassium is medium to high. The soils are strongly acid to slightly acid.

Most areas are cultivated. All the commonly grown crops are suited. Artificial drainage is not needed. A few areas are used for pasture.

Typical profile of Dana silt loam, 2 to 4 percent slopes, in a cultivated field, 95 feet north and 26 feet west of the SE. corner of sec. 20, T. 16 N., R. 10 E.

Ap—0 to 6 inches, very dark brown (10YR 2/2) silt loam; weak, fine and medium, granular structure; friable; abundant roots; neutral; abrupt, smooth boundary.

A1—6 to 11 inches, very dark brown (10YR 2/2) silt loam; moderate, fine and medium, granular structure; friable; plentiful roots; slightly acid; clear, smooth boundary.

AB—11 to 13 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, fine and medium, granular structure; friable; plentiful roots; thin, discontinuous, very dark grayish-brown (10YR 3/2) organic films; strongly acid; clear, smooth boundary.

B21t—13 to 24 inches, dark-brown (10YR 4/3) silty clay loam; strong, fine and medium, subangular blocky structure; firm; few roots; thin, continuous, dark-brown (10YR 3/3) clay films; strongly acid; clear, smooth boundary.

B22t—24 to 32 inches, dark-brown (10YR 4/3) silty clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; few roots; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; medium acid; clear, smooth boundary.

IIB23t—32 to 45 inches, dark-brown (10YR 4/3) clay loam; common, fine, distinct mottles of very dark grayish brown (10YR 3/2) and common, medium, prominent mottles of yellowish brown (10YR 5/8); moderate, coarse, subangular blocky structure; firm; few roots; thin, discontinuous, very dark gray (10YR 3/1) clay films; few iron-manganese concretions; few small pebbles; neutral; clear, smooth boundary.

IIB3t—45 to 49 inches, dark-brown (10YR 4/3) light clay loam; common, medium, distinct mottles of very dark gray (10YR 3/1) and yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; no roots; few small pebbles; few iron-manganese concretions; neutral; clear, smooth boundary.

IIC—49 to 60 inches, light olive-brown (2.5Y 5/4) loam; common, medium, distinct mottles of olive yellow (2.5Y 6/6) and dark gray (N 4/0); massive; friable; few small pebbles; strongly calcareous.

The A horizon ranges from 10 to 16 inches in thickness. The Ap horizon is very dark brown to very dark grayish brown. The upper part of the B horizon is free of mottles and is dark brown to yellowish brown in most places. The lower part of the B horizon and all of the IIC horizon is mottled and in most places is dark brown to light olive brown. The solum ranges from 40 to 70 inches in thickness, but in most places it is 45 to 55 inches thick.

Dana soils are better drained than Raub soils. They contain more sand in the lower part of the subsoil than Catlin soils. Dana soils have a thicker dark-colored surface layer and are deeper to calcareous loam till than Montmorenci soils.

Dana silt loam, 2 to 4 percent slopes (56B).—This soil occupies medium-size, irregularly shaped areas on side slopes where the topography is undulating, or areas on ridgetops where the topography is gently rolling. Included in mapping were a few small areas that have a thinner surface layer. These areas make up less than 2 percent of the acreage. Also included were some areas that have a thin, light-colored surface layer. These areas make up less than 3 percent of the acreage.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mostly for crops. It is also well suited to pasture. Control of erosion is a necessary part of good management. (Management group IIe–1)

Drummer Series

This series consists of deep, poorly drained soils. These soils are in nearly level or undulating, low-lying areas or along drainageways where the surrounding topography is more rolling. They formed in moderately thick deposits of loess and the underlying outwash, glacial till, or lakebed sediments.

In a typical profile the surface layer is black silty clay loam about 14 inches thick.

The subsoil, about 31 inches thick, is firm silty clay loam. The upper part is dark grayish brown mottled with yellowish brown or light olive brown. The lower part is olive gray mottled with yellowish brown.

The underlying material is mottled, gray, friable, stratified loam and sandy loam.

Permeability is moderate. and the available moisture capacity is very high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are neutral.

Most areas are cultivated. Corn and soybeans are the main crops. The water table is at or near the surface in spring in areas where it has not been lowered by tile drainage. These soils dry out slowly in spring, and planting must be delayed unless the soils have been fall plowed. If tilled when wet, the plow layer becomes cloddy and hard as it dries. If adequately drained and otherwise well managed, these soils are suited to most of the commonly grown crops.

Typical profile of Drummer silty clay loam, in a cultivated field in the NE. corner of SE¼ sec. 31, T. 16 N., R. 8 E.

Ap—0 to 7 inches, black (10YR 2/1) silty clay loam; moderate, coarse, granular structure; friable; abundant roots; medium acid; abrupt, smooth boundary.

A1—7 to 11 inches, black (10YR 2/1) silty clay loam; moderate, fine and medium, granular structure; friable; plentiful roots; neutral; clear, smooth boundary.

A3—11 to 14 inches, black (5Y 2/2) silty clay loam; moderate, medium, granular structure; friable; few roots; neutral; clear, smooth boundary.

B1g—14 to 16 inches, very dark grayish-brown (2.5Y 3/2) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/4); weak, very fine and fine, subangular blocky structure; firm; few roots; few iron-manganese concretions; very dark gray (N 3/0) ped coatings; neutral; clear, smooth boundary.

B21g—16 to 22 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; few, fine, distinct mottles of light olive brown (2.5Y 5/4); moderate, fine and medium, subangular blocky structure; firm; few roots; continuous clay films of very dark gray (N 3/0); few iron-manganese concretions; neutral; clear, smooth boundary.

B22g—22 to 41 inches, olive-gray (5Y 5/2, 70 percent) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6, 30 percent); moderate, medium and coarse, subangular blocky structure; firm; few roots; peds coated with dark gray (5Y 4/1); few iron-manganese concretions; mildly alkaline; gradual, smooth boundary.

IIB3g—41 to 45 inches, olive-gray (5Y 5/2, 60 percent) silty clay loam with some grit; many, coarse, distinct mottles of yellowish brown (10YR 5/6 and 5/8, 40 percent); weak, coarse, subangular blocky structure; firm; no roots; mildly alkaline; gradual, smooth boundary.

IICg—45 to 65 inches, gray (5Y 5/1, 60 percent) stratified loam and sandy loam; many, coarse, distinct mottles of light olive brown (2.5Y 5/6, 40 percent); massive; friable; no roots; mildly alkaline.

The A horizon ranges from 12 to 20 inches in thickness. The B horizon extends to a depth of 36 to 45 inches, and in some places it is clay loam in the lower part. It is olive gray to dark grayish brown. Loess ranges from 20 to 50 inches in thickness. The IIC horizon is sandy loam to silt loam outwash, loam till, or silty clay loam lakebed sediments. In most places the depth to calcareous material is more than 45 inches.

Drummer soils are not so well drained as Flanagan, Brenton, Elburn, and Raub soils. They contain less clay than Milford soils. They are deeper to calcareous material than Pella soils. Drummer soils have a thinner surface layer and are better drained than Peotone soils.

Drummer silt loam, overwash (152+).—This soil occupies small, fan-shaped areas in drainageways at at the base of slopes or areas near streams. The profile is similar to that described as typical of the series, except that the uppermost layer consists of 8 to 20 inches of dark-colored silt loam overwash. Included in mapping were a few areas where the subsoil is clay loam.

Surface runoff is slow, and there is no erosion hazard.

Most areas are used for crops. The soil is also suitable for pasture. Providing adequate drainage and protecting the soil from overflow from higher areas are necessary parts of management. (Management group IIw–2)

Drummer silty clay loam (152).—This soil occupies large, nearly level, irregularly shaped areas and medium-size, long, narrow areas where the surrounding topography is more sloping. It has the profile described as typical of the series. Included in mapping were some areas where the subsoil is clay loam and calcareous material is at a depth of less than 36 inches. Also included were three small areas of muck, southeast of Hindsboro.

Surface runoff is slow, and there is no erosion hazard.

Nearly all the acreage is used for crops. The soil is also suitable for pasture. Providing adequate drainage and maintaining tilth are management problems. Soil blowing and fire are hazards in areas of muck. (Management group IIw–2)

Elburn Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils occur in most of the county except the lakebed and timbered areas. They formed mostly in a moderately thick deposit of loess but partly in the underlying sandy loam, loam, or silt outwash. The topography is level to undulating.

In a typical profile the surface layer is mainly black silt loam about 17 inches thick.

The subsoil, more than 43 inches thick, is grayish brown mottled with yellowish brown. The upper 25 inches is firm silty clay loam. Below this is friable, stratified loam, sandy loam, and gravelly loam.

Permeability is moderate, and the available moisture capacity is high to very high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are medium acid to slightly acid.

Most areas are cultivated. The soils are well suited to all the commonly grown crops. In some areas they are too wet for cultivation unless artificial drainage is provided. A few areas are used for pasture.

Typical profile of Elburn silt loam, 0 to 2 percent slopes, in a cultivated field, 35 feet south and 600 feet west of the NE. corner of sec. 27, T. 16 N., R. 10 E.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, medium, granular structure; friable; abundant roots; medium acid; abrupt, smooth boundary.

A1—8 to 14 inches, black (10YR 2/1) silt loam; moderate, medium and coarse, granular structure; friable; plentiful roots; medium acid; clear, smooth boundary.

A3—14 to 17 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; moderate, very fine and fine, subangular blocky structure; friable; few roots; thick, continuous, black (10YR 2/1) clay-organic coatings; medium acid; clear, smooth boundary.

B21t—17 to 20 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; thick, continuous, black (10YR 2/1) clay-organic coatings; medium acid; clear, smooth boundary.

B22t—20 to 28 inches, grayish-brown (10YR 5/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; few roots; thick, continuous, very dark grayish-brown (10YR 3/2) clay films; slightly acid; clear, smooth boundary.

B23t—28 to 42 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm; few roots; continuous, very dark grayish-brown (10YR 3/2) clay films; slightly acid; clear, smooth boundary.

IIB31—42 to 54 inches, grayish-brown (2.5Y 5/2), stratified loam and sandy loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; friable; few roots; discontinuous, dark grayish-brown (10YR 4/2) clay films on vertical faces; neutral; clear, smooth boundary.

IIB32—54 to 60 inches, mixed gray (5Y 5/1) and light olive-brown (2.5Y 5/4), stratified loam, sandy loam, and gravelly loam; weak, coarse, subangular blocky structure to massive; friable; no roots; mildly alkaline.

The A horizon ranges from black to very dark grayish brown in color and from 10 to 18 inches in thickness. The B horizon is dark grayish brown to brown and is mottled. Most or all of the upper 40 inches of the B horizon formed in loess. In some areas the lower part of the B horizon is light clay loam or light sandy clay loam. The IIC horizon, which occurs at a depth greater than that described in the typical profile, is sandy loam, loam, or silt loam, and in many places this material is stratified. In some areas there are thin layers of loamy sand to sand. The solum ranges from 40 to more than 60 inches in thickness.

Elburn soils are better drained than Drummer soils, but they are not so well drained as Plano soils. They contain slightly less sand at depths between 30 and 40 inches than Brenton soils.

Elburn silt loam, 0 to 2 percent slopes (198A).—This soil occupies large and medium-size, irregularly shaped areas. It has the profile described as typical of the series. Included in mapping were a few small areas where loamy sand occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are used for crops. This soil is also suitable for pasture. Subsurface drainage is needed in a few areas. (Management group I–2)

Elburn silt loam, 2 to 4 percent slopes (198B).—This soil occupies medium-size, irregularly shaped side slopes or narrow breaks to drainageways. The profile is similar to that described as typical of the series, except that the surface layer is lighter colored and 3 to 5 inches thinner. Included in mapping were a few small areas where loamy sand occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is moderate.

Most areas are used for crops. This soil is also suitable for pasture. Control of erosion is necessary. Subsurface drainage is a minor problem in some areas. (Management group IIe–3)

Fincastle Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils are near the major streams. They formed in thin deposits of loess and the underlying loam glacial till. The topography is nearly level to undulating.

In a typical profile the surface layer is very dark grayish-brown silt loam about 5 inches thick. The subsurface layer, about 7 inches thick, consists of grayish-brown silt loam. In cultivated areas the plow layer, about 7 inches thick, is dark grayish brown.

The subsoil, about 34 inches thick, is firm. The upper part is brown silty clay loam mottled with grayish brown, and the lower part is grayish-brown clay loam mottled with yellowish brown.

The underlying material is mixed yellowish-brown and grayish-brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are strongly acid to medium acid.

Most areas are cultivated. All the commonly grown crops are suited. Artificial drainage is needed in a few places. Some areas are used for pasture or woodland.

Typical profile of Fincastle silt loam, 0 to 2 percent slopes, in a virgin area, 40 feet south of Illinois Highway 133, SW¼NE¼ sec. 15, T. 14 N., R. 10 E.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, very fine and fine, granular structure; friable; abundant roots; medium acid; clear, smooth boundary.

A2—5 to 12 inches, grayish-brown (10YR 5/2) silt loam; weak, medium and thick, platy structure breaking to moderate, fine and medium, granular; friable; abundant roots; common iron-manganese concretions; strongly acid; clear, smooth boundary.

B1—12 to 17 inches, brown (10YR 5/3) light silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, very fine and fine, subangular blocky structure; firm; plentiful roots; common iron-manganese concretions; strongly acid; clear, smooth boundary.

B21t—17 to 29 inches, brown (10YR 5/3) silty clay loam; common, fine, distinct mottles of grayish brown (2.5Y 5/2) and common, fine, faint mottles of yellowish brown (10YR 5/4); moderate, fine and medium, subangular blocky structure; firm; plentiful roots; common iron-manganese concretions; thin, continuous, grayish-brown (10YR 5/2) clay films; strongly acid; clear, smooth boundary.

IIB22t—29 to 40 inches, grayish-brown (10YR 5/2) clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm; few roots; common small iron-manganese concretions; thin, continuous, grayish-brown (10YR 5/2) clay films; few small pebbles; strongly acid; clear, smooth boundary.

IIB3—40 to 46 inches, grayish-brown (2.5Y 5/2) light clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; few roots; few small pebbles; common small iron-manganese concretions; thin, continuous, grayish-brown (10YR 5/2) clay films; neutral; clear, smooth boundary.

IIC—46 to 60 inches, mixed yellowish-brown (10YR 5/6) and grayish-brown (2.5Y 5/2) heavy loam; massive; friable; no roots; few small pebbles; calcareous.

The A horizon ranges from 10 to 18 inches in thickness. The A1 horizon is less than 6 inches thick. In cultivated areas the Ap horizon is dark grayish brown or grayish brown. The A2 horizon is dark grayish brown to light brownish gray or pale brown. The B horizon is brown to yellowish-brown silty clay loam in the upper part and mottled, grayish-brown, and yellowish-brown clay loam in the lower part. The solum ranges from 42 to 60 inches in thickness.

Fincastle soils are not so well drained as Xenia soils. They contain slightly more sand in the subsoil than Sabina soils. They have a lighter colored A2 horizon than Toronto soils.

Fincastle silt loam, 0 to 2 percent slopes (496A).—This soil occupies medium-size, irregularly shaped areas near the larger streams. It has the profile described as typical of the series. Included in mapping were a few small areas where the soil is thinner.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are used for crops. The soil is also well suited to pasture and woodland. Maintaining tilth and providing adequate drainage are necessary parts of management. (Management group IIw–1)

Fincastle silt loam, 2 to 4 percent slopes (496B).—This soil occupies irregularly shaped areas on side slopes where the topography is nearly level or on ridgetops where the topography is undulating. The profile is similar to that described as typical of the series, except that the surface and subsurface layers are slightly thinner. Included in mapping were a few small areas where the combined thickness of the surface and subsurface layers is less than that of the typical profile.

Surface runoff is medium, and the erosion hazard is moderate.

Most areas are cultivated. The soil is also well suited as pasture and woodland. Controlling erosion, providing adequate drainage, and maintaining tilth are the major concerns in managing this soil. (Management group IIe–4)

Flanagan Series

This series consists of deep, nearly level to gently sloping, somewhat poorly drained soils. These soils are in all parts of the county, except in associations where the soils are light colored. They formed mostly in moderately thick deposits of loess but partly in the underlying loam glacial till and silty clay loam lakebed sediments (fig. 8).

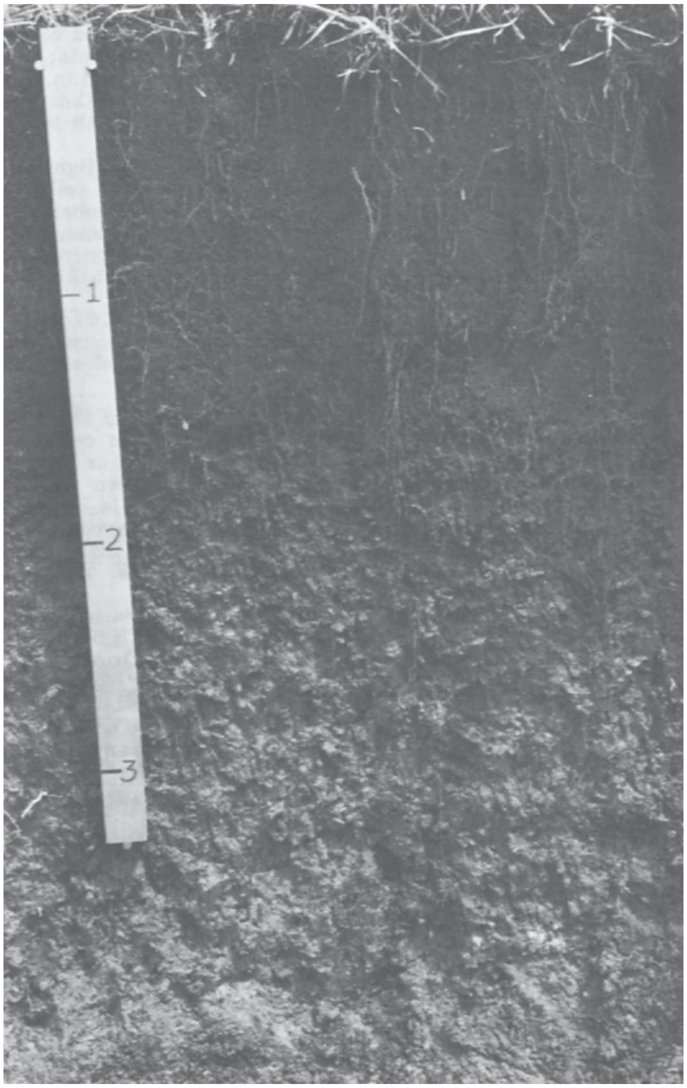


Figure 8.—Profile of Flanagan silt loam.

In a typical profile the surface layer is black silt loam about 13 inches thick.

The subsoil, about 34 inches thick, is firm silty clay loam, except for the lower few inches, which consists of clay loam. The upper part is dark brown to very dark grayish brown, and the lower part is dark grayish brown to light olive brown mottled with yellowish brown.

The underlying material is olive-gray loam mottled with light olive brown. It consists of friable, calcareous glacial till.

Permeability is moderate in the subsoil, and the available moisture capacity is very high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are medium acid to slightly acid.

Most areas are cultivated. All the commonly grown crops are suited. Artificial drainage is needed in some areas. A few areas are used for pasture.

Typical profile of Flanagan silt loam, 0 to 2 percent slopes, in a cultivated field, 18 feet east and 300 feet north of the SW. corner of sec. 29, T. 16 N., R. 9 E.

Ap—0 to 7 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; abrupt, smooth boundary.

A1—7 to 13 inches, black (10YR 2/1) silt loam; moderate, fine and medium, granular structure; friable; plentiful roots; medium acid; clear, smooth boundary.

B1—13 to 17 inches, very dark grayish-brown (10YR 3/2) light silty clay loam; moderate, very fine, subangular blocky structure; firm; plentiful roots; thin, continuous, very dark brown (10YR 2/2) clay films; strongly acid; clear, smooth boundary.

B21t—17 to 22 inches, dark-brown (10YR 4/3) heavy silty clay loam; common, fine, distinct mottles of grayish brown (10YR 5/2); moderate, fine and medium, subangular blocky structure; firm; few roots; thin, continuous, very dark brown (10YR 2/2) clay films; medium acid; clear, smooth boundary.

B22t—22 to 34 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; common, fine, faint mottles of dark brown (10YR 4/3); strong, medium, subangular blocky structure; very firm; few roots; thin, continuous, very dark gray (10YR 3/1) clay films; neutral; clear, smooth boundary.

B23t—34 to 42 inches, light olive-brown (2.5Y 5/4) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and common, medium, faint mottles of light olive brown (2.5Y 5/6); moderate, medium and coarse, subangular blocky structure; firm; few roots; thin, discontinuous, dark-gray (10YR 4/1) clay films; few soft iron-manganese concretions; few small pebbles; mildly alkaline; clear, smooth boundary.

IIB3—42 to 47 inches, dark grayish-brown (2.5Y 4/2) light clay loam; many, medium, distinct mottles of light olive brown (2.5Y 5/6); weak, coarse, subangular blocky structure; firm; few roots; few soft iron-manganese concretions; few small pebbles; mildly alkaline; clear, smooth boundary.

IIC—47 to 60 inches, olive-gray (5Y 5/2) heavy loam; many, medium, distinct mottles of light olive brown (2.5Y 5/6); massive; friable; no roots; few small pebbles; calcareous.

The A horizon ranges from 10 to 16 inches in thickness. The Ap horizon is black to very dark grayish brown. The B horizon is mottled with dark brown to olive brown. The solum, 42 to 60 inches thick, formed mostly in loess. The lower part of the solum formed in till or lakebed sediments.

Flanagan soils are better drained than Drummer soils, but they are not so well drained as Catlin soils. They contain less sand in the subsoil than Raub soils. Flanagan soils lack a light-colored A2 horizon, a layer that is characteristic of Sunbury soils. They contain less clay in the IIC horizon than Rutland soils.

Flanagan silt loam, 0 to 2 percent slopes (154A).—This soil is one of the most extensive in the county. It occupies irregularly shaped, small to large areas where the topography is nearly level. It has the profile described as typical of the series. In many places there is as much as 10 inches of stratified loam and sandy loam outwash between the loess and the underlying loam till or lakebed sediments.

Surface runoff is medium, and the erosion hazard is slight.

This soil is used mostly for crops. It is also well suited to pasture. Providing some subsurface drainage is beneficial. (Management group I–2)

Flanagan silt loam, 2 to 4 percent slopes (154B).—This soil occupies side slopes where the topography is undulating, or ridgetops where the topography is more sloping. The profile is similar to that described as typical of the series, except that the surface layer is lighter colored and 2 or 3 inches thinner. In many places there is as much as 10 inches of stratified loam and sandy loam outwash between the loess and the underlying loam till or lakebed sediments.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mostly for crops. It is also well suited to pasture. Controlling erosion is a necessary part of good management. Providing adequate drainage is a minor problem. (Management group IIe–3)

Harpster Series

This series consists of deep, level to slightly depressional, poorly drained to very poorly drained soils. These soils occur throughout the county. They formed in thin deposits of loess overlying outwash, glacial till, or lakebed sediments.

In a typical profile the surface layer is black, calcareous silty clay loam about 19 inches thick.

The subsoil, about 26 inches thick, is firm, calcareous silty clay loam. The upper part is dark gray to very dark gray mottled with light olive brown. The lower part is light brownish gray mottled with light olive brown.

The underlying material is light-gray silt loam mottled with strong brown. It is friable and calcareous.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is high. The content of phosphorus is low, and the content of available potassium is medium to low. The soils are mildly alkaline to moderately alkaline.

These soils are used mostly for crops, chiefly corn and soybeans. Undrained areas dry out slowly in spring, and planting must be delayed unless the soils have been fall plowed. If adequately drained, they are well suited to all the commonly grown crops. Applications of potash and soluble phosphate are needed. Lime is not needed.

Typical profile of Harpster silty clay loam, in a virgin area, 105 feet north of the SW. corner of NW¼SW¼ sec. 8, T. 16 N., R. 7 E.

A11—0 to 5 inches, black (10YR 2/1) light silty clay loam; weak, very fine and fine, granular structure; friable; abundant roots; few, broken, white (2.5Y 8/2) snail shells; strongly calcareous; clear, smooth boundary.

A12—5 to 14 inches, black (5Y 2/1) silty clay loam; moderate, fine, granular structure; friable; abundant roots; few broken snail shells; strongly calcareous; gradual, smooth boundary.

A13—14 to 19 inches, black (5Y 2/1) silty clay loam; moderate, very fine, subangular blocky structure; firm; plentiful roots; many snail shells; few iron-manganese concretions; strongly calcareous; clear, smooth boundary.

B1g—19 to 23 inches, very dark gray (5Y 3/1) silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful roots; many snail shells; few small lime concretions; strongly calcareous; clear, smooth boundary.

B2g—23 to 29 inches, dark-gray (5Y 4/1) silty clay loam; many, fine, distinct mottles of light olive brown (2.5Y 5/4); moderate, subangular blocky structure; firm; few roots; many snail shells; few lime concretions; strongly calcareous; clear, smooth boundary.

B3g—29 to 45 inches, light brownish-gray (2.5Y 6/2) light silty clay loam; many, fine, distinct mottles of light olive brown (2.5Y 5/6); very weak, coarse, subangular blocky structure to massive; friable; few roots; abundant lime concretions; very strongly calcareous; clear, smooth boundary.

C—45 to 60 inches, light-gray (5Y 6/1) silt loam; many, medium, distinct mottles of strong brown (7.5YR 5/6); massive; friable; no roots; very strongly calcareous.

The A horizon ranges from 14 to 24 inches in thickness. In many places it has a grayish cast when dry. Also, in many places snail shells are on the surface and scattered throughout the horizon. The depth to calcareous material is as much as 12 inches in places. The A horizon and the upper part of the B horizon range from silty clay loam to light silty clay loam. The lower part of the B horizon ranges from silty clay loam to clay loam. In most places the C horizon is loam to silt loam but ranges from sandy loam to silty clay loam. The B horizon ranges from dark gray to very dark gray or grayish brown to light brownish gray and is mottled. The solum is calcareous. In most areas there are secondary lime concretions in the B horizon.

Harpster soils are calcareous throughout the solum; Pella soils are calcareous only in the B horizon.

Harpster silty clay loam (67).—This soil occupies small, irregularly shaped, low-lying areas. Included in mapping were a few areas where the surface layer and the upper part of the subsoil are silty clay.

Surface runoff is slow, and there is no erosion hazard.

Most areas are used for crops. The soil is also well suited to pasture. Providing adequate drainage and maintaining tilth are necessary parts of good management. (Management group IIw–2)

Harvard Series

This series consists of deep, well-drained soils. The soils are near major streams. The topography is undulating. The gently sloping areas are slightly eroded, and the moderately sloping areas are eroded. These soils formed in thin deposits of loess and the underlying sandy loam, loam, or silt loam outwash.

In a typical profile the surface layer is very dark grayish-brown silt loam about 9 inches thick. The subsurface layer, about 4 inches thick, is dark-brown silt loam.

The subsoil is more than 47 inches thick. The upper part, to a depth of about 37 inches, is dark yellowish-brown, firm silty clay loam mottled with yellowish brown and pale brown. The lower part is dark-brown, friable sandy loam mottled with yellowish brown and grayish brown.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is high. The soils are medium acid to strongly acid.

Most areas are cultivated. The commonly grown crops are well suited. Artificial drainage is not needed. A few areas are sparsely wooded or are used for pasture.

Typical profile of Harvard silt loam, 1 to 4 percent slopes, in a virgin area, 100 feet east of the NW. corner of NE¼NW¼ sec. 10, T. 14 N., R. 10 E.

A1—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A2—9 to 13 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; plentiful roots; many root channels and wormholes filled with very dark grayish-brown (10YR 3/2) material; slightly acid; clear, smooth boundary.

B1—13 to 17 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful roots; thin, discontinuous, dark-brown (10YR 4/3) clay films; medium acid; clear, smooth boundary.

B21t—17 to 26 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine and medium, angular and subangular blocky structure; firm; few roots; thin, continuous, dark-brown (10YR 4/3) clay films; strongly acid; clear, smooth boundary.

IIB22t—26 to 30 inches, dark yellowish-brown (10YR 4/4) clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6) and few, fine, distinct mottles of pale brown (10YR 6/3); moderate, medium, subangular blocky structure; firm; few roots; moderately thick, continuous, dark-brown (7.5YR 4/4) clay films; strongly acid; clear, smooth boundary.

IIB23t—30 to 37 inches, dark yellowish-brown (10YR 4/4) clay loam; many, medium, distinct mottles of pale brown (10YR 6/3); moderate, coarse, subangular blocky structure; firm: few roots; thin, discontinuous, dark-brown (7.5YR 4/4) clay films; medium acid; clear, smooth boundary.

IIB31—37 to 45 inches, dark-brown (7.5YR 4/4) heavy sandy loam; common, medium, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; friable; no roots; thin, discontinuous, dark-brown (7.5YR 4/2) clay films; medium acid; gradual, smooth boundary.

IIB32—45 to 60 inches, mixed dark-brown (7.5YR 4/4), yellowish-brown (10YR 5/6), and gray (N 5/0) sandy loam; few 1-inch layers of loamy sand; structureless to weak, coarse, subangular blocky structure; friable; no roots; common, small, iron-manganese concretions; slightly acid.

The A horizon ranges from 8 to 16 inches in thickness. The A1 horizon is very dark brown to very dark grayish brown. In most places the A2 horizon is dark grayish brown to brown. The upper part of the B horizon is clay loam or silty clay loam, and the lower part is clay loam or sandy clay loam. The B3 horizon is silt loam, loam, or sandy loam. In places it is stratified with loamy sand. In some areas the lower part of the B horizon is free of mottles and lacks gray colors. The IIC horizon, at a depth greater than the lowest layer of the typical profile, is sandy loam, silt loam, or loam that is commonly stratified.

Harvard soils have a thicker A1 horizon than Camden soils. Proctor soils do not have an A2 horizon. Harvard soils are better drained than Millbrook soils.

Harvard silt loam, 1 to 4 percent slopes (344B).—This soil occupies small, irregularly shaped side slopes in areas of undulating topography. It has the profile described as typical of the series. Included in mapping were a few small areas where the subsoil is mainly silty clay loam. Also included were a few areas where loamy sand occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is used mainly for cultivated crops. It is also well suited to pasture or woodland. Control of erosion is a necessary part of management. (Management group IIe–1)

Harvard silt loam, 4 to 7 percent slopes, eroded (344C2).—This soil occupies small, irregularly shaped areas on side slopes in areas where the topography is gently rolling. The profile is similar to that described as typical of the series, except that the surface layer is thinner and, when plowed, is mixed with material from the subsoil. Included in mapping were a few small areas where loamy sand or silty clay occurs below a depth of 50 inches. Also included were areas of Proctor silt loam, 4 to 7 percent slopes. These areas of Proctor silt loam make up less than 10 percent of the acreage.

Surface runoff is medium, and the erosion hazard is moderate. The organic-matter content is medium.

Most areas are used for crops. The soil is also well suited to pasture or woodland. Control of erosion is a necessary part of management. (Management group IIe–1)

Kendall Series

This series consists of deep, level to nearly level, somewhat poorly drained soils. These soils are near the major streams. They formed mainly in moderately thick deposits of loess but partly in the underlying sandy loam, loam, and silt loam outwash.

In a typical profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer, about 4 inches thick, consists of grayish-brown silt loam.

The subsoil, about 47 inches thick, is firm. The uppermost part is grayish-brown silty clay loam mottled with brown and yellowish brown. The middle part is mixed yellowish-brown and gray light silty clay loam. The lower part is mixed gray, yellowish-brown, and strong-brown, stratified loam to sandy loam.

Permeability is moderate to moderately slow, and the available moisture capacity is high to very high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is high. Some areas are too wet in spring to promote good crop growth. The soils are medium acid to strongly acid.

Most areas are used for cultivated crops. All the commonly grown crops are suited. Artificial drainage is needed in a few places. A few areas are in woodland or are used for pasture.

Typical profile of Kendall silt loam, in a cultivated field, 20 feet south of road and 80 feet west of north-south fence, about 400 feet west of ½-mile line in SE¼NW¼ sec. 36, T. 15 N., R. 10 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; abundant roots; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine and medium, granular structure; friable; plentiful roots; slightly acid to neutral; clear, smooth boundary.

B1—11 to 14 inches, brown (10YR 5/3) light silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful roots; slightly acid; clear, smooth boundary.

B21t—14 to 25 inches, grayish-brown (10YR 5/2) silty clay loam; common, fine, faint mottles of brown (10YR 5/3); moderate, fine and medium, subangular blocky structure; firm; few roots; few iron-manganese concretions; moderately thick, continuous, dark-brown (10YR 4/3) clay films; strongly acid; clear, smooth boundary.

B22t—25 to 41 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm; few roots; few iron-manganese concretions; moderately thick, continuous, dark grayish-brown (10YR 4/2) clay films; medium acid; clear, smooth boundary.

B31—41 to 51 inches, mixed yellowish-brown (10YR 5/6) and gray (5Y 5/1) light silty clay loam; weak, coarse, subangular blocky structure; firm; few roots; few iron-manganese concretions; thin, discontinuous, gray (10YR 5/1) clay films; slightly acid; clear, smooth boundary.

IIB32—51 to 58 inches, mixed gray (5Y 5/1), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) loam to sandy loam; some fine gravel; weak, coarse, subangular blocky structure; friable; no roots; neutral; clear, smooth boundary.

IIC—58 to 65 inches, mixed yellowish-brown (10YR 5/6), gray (5Y 5/1), and strong-brown (7.5YR 5/6) stratified loam, sandy loam, and silt loam; some fine gravel; massive; friable; mildly alkaline.

The A horizon ranges from 8 to 16 inches in thickness. The Ap horizon is grayish brown to dark grayish brown, and the A2 horizon is grayish brown to pale brown. The B horizon is mottled brown to grayish brown. The lower part of the solum, formed in outwash material, ranges from light clay loam to light sandy clay loam. The solum ranges from 45 to more than 60 inches in thickness. In most areas the IIC horizon is stratified sandy clay loam, sandy loam, silt loam, or loam. Some areas have thin layers of sand or loamy sand.

Kendall soils are better drained than Sexton soils, but they are not so well drained as St. Charles soils. They contain less sand at depths between 30 and 40 inches than Starks soils.

Kendall silt loam (242).—This soil occupies small to medium-size, irregularly shaped, elevated areas where the topography is nearly level. Included in mapping were a few areas where loamy sand occurs at a depth below 50 inches.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are cultivated. This soil is also well suited to pasture or woodland. Providing adequate drainage and maintaining tilth are necessary. (Management group IIw–1)

Kernan Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils occur near the major streams in the central part of the county. They formed mainly in moderately thick deposits of loess but partly in the underlying silty clay and clay lakebed sediments.

In a typical profile the surface layer is dark grayish-brown silt loam about 5 inches thick. The subsurface layer, about 7 inches thick, is grayish-brown silt loam.

The subsoil, about 35 inches thick, is mostly grayish-brown to light olive-brown, firm heavy silty clay loam. The lower few inches are light silty clay.

The underlying material is mixed olive brown and gray silty clay. It consists of very firm, calcareous lakebed sediments.

Permeability is moderately slow, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is high. In some areas the soils are too wet in spring for crops to make good growth. They are slightly acid to neutral.

Many areas have been cleared and cultivated. Corn and soybeans are the main crops. All the commonly grown crops are suited. Uncleared areas are used for woodland or pasture.

Typical profile of Kernan silt loam, 0 to 2 percent slopes, in a cultivated field, 110 feet west and 20 feet north of utility pole at the corner of the road in NW¼SE¼NE¼ sec. 19, T. 15 N., R. 10 E.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; abundant roots; slightly acid; abrupt, smooth boundary.

A2—5 to 12 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; plentiful roots; slightly acid; clear, smooth boundary.

B1—12 to 15 inches, grayish-brown (10YR 5/2) light silty clay loam; weak, fine, subangular blocky structure; firm; few iron-manganese concretions; few roots; slightly acid; clear, smooth boundary.

B21t—15 to 21 inches, grayish-brown (10YR 5/2) heavy silty clay loam; many, medium, faint mottles of yellowish brown (10YR 5/4); moderate, fine, subangular blocky structure; firm; common iron-manganese concretions; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films; few roots; slightly acid; gradual, smooth boundary.

B22t—21 to 30 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; many medium and fine mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) clay films; many small iron-manganese concretions; few roots; neutral; clear, smooth boundary.

B23t—30 to 42 inches, light olive-brown (2.5Y 5/4) silty clay loam; many, medium and coarse, distinct mottles of yellowish brown (10YR 5/6); moderate, coarse, subangular blocky structure; firm; few roots; moderately thick dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; neutral; clear, smooth boundary.

IIB3—42 to 47 inches, olive-brown (2.5Y 4/4) light silty clay; common, medium, distinct mottles of olive (5Y 5/6); weak, coarse, subangular blocky structure; firm; no roots; thin, discontinuous, grayish-brown (10YR 5/2) clay films; mildly alkaline; clear smooth boundary.

IIC—47 to 60 inches, mixed olive-brown (2.5Y 4/4) and gray (5Y 5/1) silty clay; massive; very firm; calcareous.

The A horizon ranges from 10 to 15 inches in thickness. The plow layer ranges from dark grayish brown to grayish brown. The solum ranges from 40 to 55 inches in thickness. The IIC horizon consists of lakebed sediments. It is either silty clay or clay and in some areas is stratified with thin layers of sandy loam to silty clay loam sediments.

Kernan soils have a lighter colored A horizon than Rutland soils. They are deeper over the underlying lakebed sediments that Nappanee soils.

Kernan silt loam, 0 to 2 percent slopes (554A).—This soil occupies small to medium-size, irregularly shaped, slightly elevated positions. It has the profile described as typical of the series. Included in mapping were areas that have a darker colored surface layer.

Surface runoff is medium, and the erosion hazard is slight.

This soil is suited to crops, pasture, and woodland. Providing adequate drainage and maintaining tilth are necessary parts of good management. (Management group IIw–1)

Kernan silt loam, 2 to 4 percent slopes (554B).—This soil occupies small, irregularly shaped side slopes. The profile is similar to that described as typical of the series, except that the subsurface layer is thinner. Included in mapping were a few small areas that have a thinner surface and subsurface layer. Also included were some areas that are moderately well drained.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is suited to crops, pasture, and woodland. Providing adequate drainage, controlling erosion, and maintaining tilth are necessary parts of good management. (Management group IIe–4)

Lawson Series

This series consists of deep, level to nearly level, somewhat poorly drained soils. These soils occur on flood plains of the Embarras and Kaskaskia Rivers and their main tributaries. They formed in dark-colored silt loam alluvial material.

In a typical profile the surface layer is black to very dark grayish-brown silt loam about 33 inches thick. The underlying material is mixed dark grayish-brown, grayish-brown, and olive, friable silt loam and loam.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is high. The content of phosphorus and potassium is high. The soils are slightly acid to neutral.

The acreage used for crops, pasture, and woodland is about equal. Corn and soybeans are the main cultivated crops.

Typical profile of Lawson silt loam, in a virgin area, 10 feet south and 120 feet east of junction of the center of the road and east-west fence, NW¼SW¼ sec. 6, T. 15 N., R. 7 E.

A11—0 to 12 inches, black (10YR 2/1) silt loam; moderate, very fine and fine, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A12—12 to 17 inches, black (10YR 2/1) silt loam; weak, very fine and fine, granular structure; friable; plentiful roots; neutral; clear, smooth boundary.

A13—17 to 26 inches, very dark gray (10YR 3/1) silt loam; few, fine, faint mottles of dark brown (7.5YR 3/2); weak, very fine and fine, granular structure; friable; few roots; neutral; clear, smooth boundary.

A14—26 to 33 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, very fine and fine, granular structure; friable; few roots; few small iron-manganese concretions; neutral; clear, smooth boundary.

C1—33 to 41 inches, mixed dark grayish-brown (10YR 4/2, 50 percent) and grayish-brown (2.5Y 5/2, 50 percent) gritty silt loam to loam; massive to weak, very fine and fine, granular structure; friable; few roots; few small iron-manganese concretions; neutral; clear, smooth boundary.

C2—41 to 60 inches, mixed grayish-brown (2.5Y 5/2) and olive (5Y 5/3) stratified loam; massive; friable; no roots; few iron-manganese concretions; neutral.

The A horizon is black or very dark gray to very dark grayish brown and is 24 inches or more in thickness. The A horizon ranges from silt loam to loam in texture but is more commonly silt loam. In some places the lower part of the A horizon and the C horizon are dark gray to dark brown and are mottled. Lenses of sandy loam or silty clay loam occur at a depth below 30 inches in some areas.

Lawson soils are better drained than Sawmill soils, and they contain less clay.

Lawson silt loam (451).—This soil occupies large areas on bottom lands. Included in mapping were a few areas that are sandy at a depth below 30 inches. Also included were areas too wet for use as cropland. Drainage is a serious problem in the wet areas, and the management practices needed are more like those described for management group Vw–1.

Surface runoff is slow, and flooding is a hazard. There is no erosion hazard.

This soil is well suited to crops, pasture, and woodland. Some areas need additional drainage. (Management group I–3)

Miami Series

This series consists of deep, moderately sloping to strongly sloping, well-drained soils. These soils occupy small, irregularly shaped areas along the Kaskaskia and Embarras Rivers where the topography is rolling. They formed in thin deposits of loess and the underlying loam glacial till.

In a typical profile the surface layer is dark grayish-brown silt loam about 6 inches thick.

The subsoil, about 32 inches thick, is dark-brown to brown, friable to firm silty clay loam and clay loam.

The underlying layer is brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to a depth of about 33 inches, but it is moderate to moderately slow below that depth. The available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium. The soils are medium acid to neutral.

Most areas have been cleared and cultivated (fig. 9). All the commonly grown crops are suited. Erosion control and regular fertilization are important. Artificial drainage is not needed. Uncleared areas are used for woodland or pasture.

Typical profile of Miami silt loam, 4 to 7 percent slopes, eroded, in a cultivated field, 60 feet south and 35 feet west of curve in the road and fence to the east, in SW¼NE¼ sec. 6, T. 15 N., R. 7 E.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; abundant roots; medium acid; abrupt, smooth boundary.

B1—6 to 11 inches, brown (10YR 5/3) light silty clay loam; moderate, very fine and fine, subangular blocky structure; friable; plentiful roots; medium acid; clear, smooth boundary.

IIB21t—11 to 19 inches, dark-brown (10YR 4/3) clay loam; strong, medium, subangular blocky structure; firm; few roots; clay films of very dark brown (10YR 3/3) and silica coatings of pale brown (10YR 6/3); few 1/8- to 1/2-inch pebbles; medium acid; clear, smooth boundary.

IIB22t—19 to 30 inches, dark-brown (10YR 4/3) clay loam;

Figure 9.—An area of Miami soils. The areas in the foreground are eroded, and those in the background are severely eroded.

moderate, medium, subangular blocky structure; firm; few roots; continuous, dark-brown (10YR 3/3) clay films; few 1/8- to 1/2-inch pebbles; neutral; clear, smooth boundary.

IIB3—30 to 38 inches, brown (10YR 5/3) light clay loam; weak, medium and coarse, subangular blocky structure; firm; few roots; thin, scattered, dark-brown (10YR 3/3) clay films, mostly on vertical faces; few 1/8- to 1/2-inch pebbles; strongly calcareous; clear, smooth boundary.

IIC—38 to 60 inches, brown (10YR 5/3) heavy loam, massive; friable; no roots; few 1/8- to 1/2-inch pebbles; strongly calcareous.

The Ap horizon is dark grayish brown to brown and ranges from 4 to 8 inches in thickness. The B horizon is dark brown to yellowish brown and ranges from silty clay loam to clay loam in texture. Most of the B horizon formed in till. The solum ranges from 24 to 40 inches in thickness. The C horizon is loam or heavy loam.

Miami soils have a lighter colored surface layer than Montmorenci soils. They are deeper to calcareous glacial till than Strawn soils, but they are not so deep as Russell or Xenia soils.

Miami silt loam, 4 to 7 percent slopes, eroded (27C2).—This soil occupies small, irregularly shaped areas near more sloping soils or long, narrow areas adjacent to drainageways. It has the profile described as typical of the series.

Surface runoff is rapid, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, and woodland. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IIe–2)

Miami silt loam, 7 to 12 percent slopes, eroded (27D2).—This soil is on long, narrow breaks near bottom lands or along drainageways. Included in mapping were a few small areas that have a thinner subsoil.

Surface runoff is rapid, and the erosion hazard is severe.

This soil is suited to crops, pasture, and woodland if erosion is adequately controlled. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IIIe–1)

Miami soils, 4 to 7 percent slopes, severely eroded (27C3).—These soils occupy long, narrow areas adjacent to drainageways or small, irregularly shaped areas near more sloping soils. They have a profile similar to that described as typical of the series, except that the surface layer, which consists mostly or entirely of subsoil material, is brown light silty clay loam or light clay loam. Included in mapping were a few small areas where the subsoil is thinner. Also included was a small acreage that has a darker surface layer or where the slope is less than 4 percent or more than 7 percent.

Surface runoff is rapid, and the erosion hazard is severe.

These soils are suited to crops, pasture, and woodland if erosion is adequately controlled. Control of erosion and maintenance of tilth are necessary parts of good management. (Management group IIIe–1)

Miami soils, 7 to 12 percent slopes, severely eroded (27D3).—These soils are on long, narrow breaks to bottom lands or along drainageways. They have a profile similar to that described as typical of the series, except that the surface layer, which consists mostly or entirely of subsoil material, is brown light silty clay loam or light clay loam. Included in mapping were a few areas where the subsoil is thinner or where the slope is less than 7 percent or more than 12 percent.

Surface runoff is very rapid, and the erosion hazard is very severe.

These soils are suited to hay and to pasture or woodland. Small areas are used for corn and soybeans. The most serious management problems are control of erosion and maintenance of tilth. (Management group IVe–1)

Milford Series

This series consists of deep, level to nearly level, poorly drained to very poorly drained soils. These soils occur mainly in the lakebed areas in the central and south-central parts of the county, but there are a few small areas in the northwestern corner of the county. They generally surround small, slightly higher lying, somewhat poorly drained areas. They formed in thin deposits of loess and the underlying silty clay loam and silty clay lakebed sediments.

In a typical profile the surface layer is black or very dark gray, firm silty clay loam about 19 inches thick.

The subsoil is dark-gray to gray, firm heavy silty clay loam or silty clay mottled with yellowish brown. It is about 24 inches thick.

The underlying material is mixed yellowish-brown and gray, firm silty clay loam. It consists of calcareous lakebed sediments.

Permeability is moderately slow to slow, and the available moisture capacity is high. The organic-matter content is high. The content of phosphorus is low, and the content of potassium is high. The soils are wet unless they are artificially drained. They are neutral to mildly alkaline.

Most areas are used for crops, chiefly corn and soybeans. If adequately drained and otherwise well managed, these soils are suited to most crops grown in the county.

Typical profile of Milford silty clay loam [5] in a cultivated field, 47 feet south of road and 354 feet east of the NW. corner of sec. 26, T. 15 N., R. 9 E.

Ap—0 to 7 inches, black (10YR 2/1) heavy silty clay loam; moderate, fine and medium, angular blocky structure; firm; neutral; clear, smooth boundary.

A1—7 to 15 inches, black to very dark gray (10YR 2/1 to 3/1) heavy silty clay loam; moderate, fine, subangular blocky structure breaking readily to moderate, medium, granular; firm; neutral; clear, smooth boundary.

A3—15 to 19 inches, very dark gray (10YR 3/1) heavy silty clay loam; few, fine, distinct mottles of light olive brown (2.5Y 5/6); moderate, medium, angular blocky structure breaking readily to moderate, fine, subangular and angular blocky; firm; few, fine, very dark gray (10YR 3/1) organic coatings; scattered iron-manganese concretions; slightly acid; clear, smooth boundary.

B21g—19 to 23 inches, dark-gray (10YR 4/1) heavy silty clay loam to light silty clay; common, fine, faint mottles of dark grayish brown (2.5Y 4/2); moderate, medium, angular blocky structure; firm; common very dark gray (10YR 3/1) ped coatings; neutral; clear, smooth boundary.

B22g—23 to 30 inches, dark-gray (5Y 4/1) heavy silty clay loam; common, fine, distinct mottles of light olive brown (2.5Y 5/4); moderate, medium, prismatic structure breaking readily to moderate to strong, medium and coarse, angular blocky; firm; common very dark gray (10YR 3/1) ped coatings; few iron-manganese concretions; neutral; clear, smooth boundary.

B23g—30 to 34 inches, gray (5Y 5/1) heavy silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, medium and coarse, angular blocky structure; firm; few very dark gray (10YR 3/1) ped coatings; few iron-manganese concretions; neutral; clear, smooth boundary.

IIB3g—34 to 43 inches, gray (N 5/0) silty clay loam; some sand grains; common, medium, distinct mottles of yellowish brown (10YR 5/4); weak to moderate, coarse, angular blocky structure; firm; few dark yellowish-brown (10YR 4/4) ped coatings; many iron-manganese concretions; mildly alkaline; clear, smooth boundary.

IIC1—43 to 52 inches, mixed yellowish-brown (10YR 5/6) and gray (5Y 5/1) silty clay loam; some sand grains; massive; firm; calcareous; clear, smooth boundary.

IIC2—52 to 60 inches, gray (10YR 5/1) heavy clay loam to silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/4); massive; firm; calcareous.

The A horizon ranges from black to very dark gray in color and from silty clay loam to silty clay in texture. It ranges from 10 to 22 inches in thickness. The B horizon ranges from heavy silty clay loam to silty clay in texture. In most places the solum ranges from 40 to 50 inches in thickness. The material below the solum is calcareous, and in some areas the lower part of the solum is calcareous. The IIC horizon consists of stratified material that is silty clay loam in most places but ranges from silt loam to clay.

Milford soils contain more clay and are less permeable in the subsoil than Drummer and Pella soils. They have a thinner A horizon than Wabash soils.

Milford silty clay loam (69).—This soil occupies the lowest areas in lakebeds. Included in mapping were a few small areas where the subsoil and underlying material are clay loam, areas that have recent deposits of silt loam on the surface, and areas that are too wet for cultivation.

Surface runoff is slow, and there is no erosion hazard.

Most areas are used for crops. This soil is also well suited to pasture. The major concerns in management are the moderately slow internal movement of water, the need for adequate drainage, and the need to maintain tilth. (Management group IIw–2)

Millbrook Series

This series consists of deep, level to nearly level, somewhat poorly drained soils near major streams. These soils formed in thin deposits of loess and the underlying loamy, stratified outwash.

In a typical profile the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer, about 6 inches thick, is grayish-brown silt loam.

The subsoil, about 37 inches thick, is dark grayish-brown, firm silty clay loam in the upper part and strong-brown, friable sandy clay loam in the lower part.

The underlying material is reddish-brown, friable sandy loam.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is medium to high. The soils are slightly acid to neutral.

Most areas are cultivated. All the commonly grown crops are suited. In some areas the soils are too wet for cultivation in spring. Artificial drainage is needed in a few areas. Areas not cultivated remain in scattered trees and bluegrass pasture.

Typical profile of Millbrook silt loam (0 to 2 percent slopes) in a virgin area, 1,150 feet south of the NW. corner of sec. 2, T. 16 N., R. 9 E.

A1—0 to 7 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

A2—7 to 13 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; cleavage faces coated with dark grayish brown (10YR 4/2); slightly acid; clear, smooth boundary.

B1—13 to 16 inches, dark grayish-brown (10YR 4/2) light silty clay loam; weak, fine and medium, subangular blocky structure; friable to firm; pale-brown (10YR 6/3) silica coatings on ped faces; slightly acid; clear, smooth boundary.

B21t—16 to 29 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/4) and light olive brown (2.5Y 5/4); moderate, medium, subangular blocky structure; firm; few small iron-manganese concretions; slightly acid; clear, smooth boundary.

IIB22t—29 to 37 inches, dark grayish-brown (10YR 4/2) clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/4) and light olive brown (2.5Y 5/4); moderate, coarse, subangular blocky structure; firm; neutral; clear, smooth boundary.

IIB3—37 to 50 inches, strong-brown (7.5YR 5/6) sandy clay loam; many, coarse, distinct mottles of dark yellowish brown (10YR 3/4); weak, coarse, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

---

[5] Chemical and physical data for this profile are given in the section "Laboratory Data" p. 79.

IIC—50 to 60 inches, reddish-brown (5YR 4/3) sandy loam; massive; friable; mildly alkaline.

The A horizon ranges from 10 to 17 inches in thickness. The A1 horizon is black to very dark grayish brown. The A2 horizon is brown to dark grayish brown. The B horizon is silty clay loam to clay loam in the upper part and clay loam to sandy clay loam in the lower part. The B horizon is dark brown to dark grayish brown and is mottled. In most places the solum ranges from 40 to 55 inches in thickness. The IIC horizon is reddish-brown to yellowish-brown silt loam, sandy loam, or loam that, in many places, is stratified.

Millbrook soils are not so well drained as Harvard soils, but they are better drained than Brooklyn soils. They have an A2 horizon, a layer that is lacking in Brenton soils. Millbrook soils have a darker colored surface layer than Starks soils.

Millbrook silt loam (219).—This soil occurs on slightly elevated areas near more poorly drained soils or on nearly level areas near more sloping soils. Included in mapping were a few areas where loamy sand occurs at a depth below 50 inches. Also included were a few areas where the slope range is 3 to 4 percent. These areas make up less than 8 percent of the acreage.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are used for crops. The soil is also well suited to pasture or woodland. Artificial drainage is needed in a few areas. (Management group I–2)

Montmorenci Series

This series consists of deep, moderately well drained soils. These soils occur mainly in the eastern part of the county where the topography is gently rolling to moderately rolling. They formed in loam glacial till.

In a typical profile the plow layer is very dark grayish-brown silt loam about 8 inches thick.

The subsoil, about 29 inches thick, is firm silty clay loam or clay loam. The upper part is yellowish brown, and the lower part is brown to light olive brown mottled with grayish brown.

The underlying material is light olive-brown loam mottled with grayish brown. It consists of friable, calcareous glacial till.

Permeability is moderate to a depth of about 3 feet; below that depth, it is moderate to moderately slow. The available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is medium. The soils are slightly acid to strongly acid.

Most areas are used for crops. All the commonly grown crops are suited. Artificial drainage is not needed. Control of erosion is important. A few areas are used for pasture.

Typical profile of Montmorenci silt loam, 4 to 7 percent slopes, eroded, in a cultivated field, 480 feet west and 455 feet north of the SE. corner of SW¼ sec. 22, T. 16 N., R. 10 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2, 80 percent) gritty silt loam mixed with dark yellowish-brown (10YR 4/4, 20 percent) light silty clay loam; moderate, fine, granular structure; friable; abundant roots; neutral; abrupt, smooth boundary.

B1—8 to 12 inches, dark yellowish-brown (10YR 4/4) gritty light silty clay loam; moderate, very fine and fine, subangular blocky structure; firm; few roots; thin, discontinuous, dark-brown (10YR 4/3) clay films; medium acid; clear, smooth boundary.

B21t—12 to 23 inches, yellowish-brown (10YR 5/4) gritty silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; continuous dark-brown (10YR 4/3) clay films; few small pebbles; strongly acid; clear, smooth boundary.

B22t—23 to 33 inches, brown (10YR 5/3) clay loam; common, medium, distinct mottles of light olive brown (2.5Y 5/4) and few, medium, distinct mottles of grayish brown (2.5Y 5/2); moderate, medium, subangular blocky structure; firm; few roots; thin, continuous, dark-brown (10YR 4/3) clay films; few iron-manganese concretions; few small pebbles; medium acid; clear, smooth boundary.

B3—33 to 37 inches, light olive-brown (2.5Y 5/4) light clay loam; common, fine, faint mottles of grayish brown (2.5Y 5/2); weak, coarse, subangular blocky structure; firm; few roots; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; few small pebbles; slightly acid; clear, smooth boundary.

C—37 to 60 inches, light olive-brown (2.5Y 5/4) loam; few, fine, faint mottles of grayish brown (2.5Y 5/2); massive; friable; no roots; few small pebbles; calcareous.

The A horizon ranges from 6 to 12 inches in thickness. The Ap horizon is very dark brown to dark yellowish brown. The upper part of the B horizon is dark yellowish brown, yellowish brown, or brown. The material in the lower part of the B horizon and in the C horizon is mottled and in most places is olive brown or light olive brown. The solum ranges from 24 to 40 inches in thickness.

Montmorenci soils have a darker colored surface layer than Miami soils. They are not so deep to calcareous glacial till as Dana soils.

Montmorenci silt loam, 4 to 7 percent slopes, eroded (57C2).—This soil occupies medium-size, irregularly shaped areas on side slopes. In many places it is near drainageways. Included in mapping were a few areas that have a thinner subsoil. Also included was a small acreage where the slope is less than 4 percent or more than 7 percent. In addition, a small acreage was included where the surface layer is thicker.

Surface runoff is rapid, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, and woodland. Control of erosion is a necessary part of management. (Management group IIe–1)

Nappanee Series

This series consists of deep, strongly sloping, somewhat poorly drained soils on breaks near major streams. These soils occur in lakebed areas. They formed in thin deposits of outwash or loess and the underlying silty clay or clay lakebed sediments.

In a typical profile the plow layer is mixed dark grayish-brown and brown light clay loam about 4 inches thick.

The subsoil, about 14 inches thick, is yellowish-brown to light olive-brown, firm silty clay loam to clay mottled with olive gray.

The underlying material is mixed light olive-brown and dark greenish-gray clay. It consists of very firm, calcareous lakebed sediments.

Permeability is slow to very slow, and the available moisture capacity is moderate. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium. The soils are neutral to mildly alkaline.

Many areas are cultivated, but the soils are not suited to most of the commonly grown crops. Some areas are too wet for crops. Other areas are used for pasture or woodland.

Typical profile of Nappanee soils, 5 to 12 percent slopes, severely eroded, in a cultivated field, 450 feet south of the corner of the road and 35 feet west of SE¼NE¼ sec. 18, T. 15 N., R. 9 E.

Ap—0 to 4 inches, mixed dark grayish-brown (10YR 4/2) and brown (10YR 4/3) light clay loam; weak, medium, granular structure; friable; plentiful roots; moderately alkaline; abrupt, smooth boundary.

B21t—4 to 10 inches, yellowish-brown (10YR 5/4) silty clay loam; common, coarse, distinct mottles of olive gray (5Y 5/2); weak, fine and medium, subangular blocky structure; firm; few roots; very dark grayish-brown (10YR 3/2) clay films; few iron-manganese concretions; neutral; gradual, smooth boundary.

B22t—10 to 14 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; many, coarse, distinct mottles of olive gray (5Y 5/2); moderate, fine and medium, angular blocky structure; firm; few roots; discontinuous, dark grayish-brown (2.5Y 4/2) clay films; few iron-manganese concretions; few small pebbles; mildly alkaline; clear, wavy boundary.

IIB3t—14 to 18 inches, light olive-brown (2.5Y 5/4) silty clay; many, coarse, distinct mottles of olive gray (5Y 5/2); strong, medium and coarse, angular blocky structure; very firm; no roots; discontinuous, very dark gray (10YR 3/1) to dark-gray (10YR 4/1) clay films; few iron-manganese concretions; moderately alkaline; clear, smooth boundary.

IIC—18 to 60 inches, mixed light olive-brown (2.5Y 5/4) and dark greenish-gray (5GY 4/1) clay; strong, coarse, angular blocky structure that becomes massive with depth; very firm; no roots; few, soft, light-gray (10YR 7/1) lime concretions; strongly calcareous.

The Ap horizon is dark grayish-brown to brown light clay loam or silty clay loam. The B horizon is silty clay loam or silty clay. The B and C horizons in most areas are in shades of olive, gray, or brown. In most areas the solum ranges from 12 to 24 inches in thickness. The IIC horizon is silty clay or clay that is stratified in many places.

Nappanee soils are not so deep to the underlying clayey lakebed sediments as Kernan soils. They contain more clay in the subsoil and underlying material than Strawn soils.

Nappanee soils, 5 to 12 percent slopes, severely eroded (228D3).—These soils are on narrow breaks along streams in lakebed areas. The surface layer ranges from light clay loam to light silty clay loam in texture. Included in mapping were a few areas where the plow layer is sandy loam and the subsoil is clay loam, as well as a few areas where the underlying material is exposed. Also included were areas where the slope is less than 5 percent or more than 12 percent and a few areas where the surface layer is silt loam.

Surface runoff is very rapid, and the erosion hazard is very severe.

These soils are better suited to pasture or woodland than to other uses. Slow internal movement of water, control of erosion, and maintenance of tilth are serious problems in management. (Management group VIe–1)

Pella Series

This series consists of deep, level to slightly depressional, poorly drained and very poorly drained soils. These soils occur in all parts of the county except in lakebed areas. They occupy small, isolated areas in the central and the eastern parts of the county and large areas in the western part. They formed in thin deposits of loess and the underlying outwash or glacial till.

In a typical profile the surface layer is black to very dark gray, firm silty clay loam about 18 inches thick.

The subsoil, about 20 inches thick, is dark-gray to light-gray silty clay loam mottled with yellowish brown. The upper part is firm; the lower part is friable and calcareous.

The underlying material is light-gray, stratified silt loam and silty clay loam mottled with yellowish brown. It contains lenses of sand and is friable and calcareous.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are neutral to moderately alkaline.

Most areas are cultivated. Corn and soybeans are the main crops. Unless the soils are artificially drained, most areas are wet. Drained areas are suited to most of the commonly grown crops.

Typical profile of Pella silty clay loam, in a cultivated field, 45 feet east of the center of the road and 120 feet south of the NW. corner of sec. 17, T. 16 N., R. 7 E.

Ap—0 to 7 inches, black (10YR 2/1) silty clay loam; moderate, medium, granular structure; firm; slightly acid; abrupt, smooth boundary.

A1—7 to 14 inches, black (10YR 2/1) silty clay loam; moderate, fine and medium, granular structure; firm; neutral; clear, smooth boundary.

A3—14 to 18 inches, very dark gray (10YR 3/1) silty clay loam; moderate, fine and medium, granular structure; firm; mildly alkaline; gradual, smooth boundary.

B2g—18 to 29 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, fine and medium, angular blocky structure; firm; continuous, thick, very dark gray (10YR 3/1) ped coatings; common, very pale brown (10YR 7/3) concretions of secondary lime; strongly calcareous; abrupt, smooth boundary.

IIB3g—29 to 38 inches, mixed gray (10YR 5/1) and light-gray (10YR 6/1) light silty clay loam that contains some sand; many, medium, prominent mottles of yellowish brown (10YR 5/4); weak, coarse, subangular blocky structure; friable; many light brownish-gray (2.5Y 6/2) lime concretions; strongly calcareous; clear, smooth boundary.

IICg—38 to 60 inches, light-gray (5Y 6/1) stratified silt loam and silty clay loam that contains some lenses of sand; many, medium, prominent mottles of yellowish brown (10YR 5/6); massive; friable; common light-gray (N 7/0) concretions of secondary lime; strongly calcareous.

The A horizon ranges from black to very dark gray in color and from 12 to 20 inches in thickness. The B horizon ranges from dark grayish brown to gray and is mottled. It extends to a depth of 24 to 45 inches. In some places it is clay loam or light silty clay loam. The depth to carbonates ranges from 12 to 36 inches. Concretions of lime occur in many places below this depth and extend downward throughout the solum. The C horizon ranges from silty clay loam to sandy loam in texture.

Pella soils are not so deep to calcareous material as Drummer soils, but they are deeper than Harpster soils, which commonly are calcareous throughout the profile. Pella soils contain less clay in the subsoil than Milford soils.

Pella silty clay loam (153).—This soil occupies small to large, irregularly shaped to circular, level areas or depressions. Included in mapping were a few small areas where the surface and subsurface layers are thicker than those of the typical profile.

Surface runoff is ponded to slow, and there is no erosion hazard.

Most areas are used for crops, but this soil is also well suited to pasture. Providing adequate drainage and maintaining tilth are necessary parts of good management. (Management group IIw–2)

Peotone Series

This series consists of deep, very poorly drained soils. These soils occur in depressions where the topography is nearly level to undulating. They formed in moderately thick deposits of loess overlying loamy outwash or loam glacial till.

In a typical profile the surface layer is black silty clay loam about 21 inches thick.

The subsoil is about 32 inches thick. The uppermost part is very dark gray, very firm light silty clay mottled with olive gray and light olive brown. The middle part is olive-gray, firm silty clay loam. The lower part is mixed gray and yellowish-brown, firm silty clay loam.

The underlying material is mixed light olive-brown and gray loam. It consists of friable, calcareous glacial till.

Permeability is moderately slow, and the available moisture capacity is high to very high. The organic-matter content is very high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are slightly acid to neutral.

Most areas are cultivated. Corn and soybeans are the main crops. Unless the soils are artifically drained, most areas are wet. Drained areas are suited to most of the commonly grown crops.

Typical profile of Peotone silty clay loam, 60 feet west of the center of the road and 200 feet north of the SE. corner of NE¼SE¼ sec. 12, T. 16 N., R. 8 E.

Ap—0 to 8 inches, black (10YR 2/1) heavy silty clay loam; weak, medium, granular structure; firm; abundant roots; medium acid; abrupt, smooth boundary.

A1—8 to 21 inches, black (10YR 2/1) heavy silty clay loam; moderate, fine, granular structure; firm; slightly acid; clear, smooth boundary.

B1—21 to 27 inches, very dark gray (10YR 3/1) light silty clay; few, fine, distinct mottles of light olive brown (2.5Y 5/4); moderate, fine, subangular blocky structure; very firm; plentiful roots; slightly acid; clear, smooth boundary.

B21g—27 to 34 inches, dark-gray (5Y 4/1) light silty clay; few, fine, faint mottles of olive gray (5Y 5/2) and few, fine, distinct mottles of light olive brown (2.5Y 5/4); moderate, medium, prismatic structure breaking readily to moderate, fine and medium, angular blocky; very firm; few roots; thin, continuous, dark-gray (5Y 4/1) ped films; neutral; clear, smooth boundary.

B22g—34 to 41 inches, olive-gray (5Y 5/2) silty clay loam; few, fine, faint mottles of light olive brown (2.5Y 5/4); moderate, medium, prismatic structure breaking readily to moderate, medium, angular blocky; firm; few roots; continuous, thin, gray (5Y 5/1) ped films; neutral; clear, smooth boundary.

B3g—41 to 53 inches, mixed gray (5Y 5/1) and yellowish-brown (10YR 5/6) silty clay loam; weak, coarse, angular blocky structure; firm; few roots; few small iron-manganese concretions; mildly alkaline; clear, smooth boundary.

IIC—53 to 60 inches, mixed light olive-brown (2.5Y 5/6) and gray (5Y 5/1) heavy loam; massive; friable; few pebbles and sand grains; calcareous till.

The A horizon ranges from 20 to 30 inches in thickness. The B horizon is dark gray to olive gray. The B3 horizon is mixed gray and yellowish brown. It ranges from heavy silty clay loam to light silty clay in the upper part and from silty clay loam to clay loam in the lower part. The loess ranges from 30 to 55 inches in thickness, and the solum, from 36 to 60 inches. The IIC horizon is sandy loam to silt loam outwash or loam glacial till.

Peotone soils have a thicker surface layer than Drummer soils, and they are more poorly drained. They contain more clay in the subsoil than Sawmill soils, but less clay in the lower part of the A horizon than Wabash soils.

Peotone silty clay loam (330).—This soil occupies small, circular areas in depressions. Included in mapping were a few areas where the surface layer is thinner than that of the profile described as typical. Also included were a few areas that are too wet for cultivation and a few small areas where calcareous material is at a depth of less than 36 inches.

Surface runoff is ponded, and erosion is not a hazard.

Most areas are used for crops. In spring and early in summer, crops are damaged occasionally by excess water. The soil is also well suited to pasture. Providing adequate drainage and maintaining tilth are necessary for good management. (Management group IIIw–1)

Plano Series

This series consists of deep, gently sloping, moderately well drained and well drained soils. These soils occupy small, widely scattered areas in many parts of the county. They do not occur in lakebed areas or near the Embarras and Kaskaskia Rivers. They formed in moderately thick deposits of loess and the underlying sandy loam, loam, or silt loam outwash. The topography is undulating.

In a typical profile the surface layer is very dark brown to very dark grayish-brown silt loam about 14 inches thick.

The subsoil is more than 46 inches thick. The uppermost part is dark-brown to yellowish-brown, firm silty clay loam. The middle part is light olive-brown, firm silt loam mottled with pale olive and yellowish brown.

The lower part is mixed yellowish-brown and dark-brown, friable sandy clay loam to sandy loam.

Permeability is moderate, and the available moisture capacity is high to very high. The organic-matter content is high. The content of phosphorus is low, and the content of potassium is high. The soils are slightly acid to medium acid.

Most areas are cultivated. All the commonly grown crops are well suited. Artificial drainage is not needed. A few areas are used for pasture.

Typical profile of Plano silt loam, 1 to 4 percent slopes, in a virgin area, in west roadbank, 520 feet south of the NE. corner of SE¼ sec. 6, T. 14 N., R. 14 W.

A1—0 to 10 inches, very dark brown (10YR 2/2) silt loam; moderate, fine and medium, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A3—10 to 14 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; moderate, fine and medium, granular structure; friable to firm; plentiful roots; neutral; clear, smooth boundary.

B1—14 to 18 inches, dark-brown (10YR 4/3) light silty clay loam; moderate, very fine and fine, subangular blocky structure; firm; plentiful roots; thin, discontinuous, dark-brown (10YR 3/3) clay films; neutral; gradual, smooth boundary.

B21t—18 to 25 inches, dark-brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; slightly acid; gradual, smooth boundary.

B22t—25 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/6); moderate to strong, medium, subangular blocky structure; firm; few roots; thin, continuous, dark grayish-brown (10YR 4/2) clay films; medium acid; gradual, smooth boundary.

B31—34 to 44 inches, light olive-brown (2.5Y 5/4) heavy silt loam; common, medium, distinct mottles of pale olive (5Y 6/3) and yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; few roots; brown (10YR 5/3), discontinuous clay films on vertical ped faces; few small iron-manganese concretions; medium acid; abrupt, smooth boundary.

IIB32—44 to 60 inches, mixed yellowish-brown (10YR 5/4) and dark-brown (10YR 4/3 and 7.5YR 4/2) light sandy clay loam or sandy loam; weak, coarse, subangular blocky structure; discontinuous, brown (10YR 5/3) clay films on some vertical faces; friable; no roots; few small iron-manganese concretions; medium acid.

The A1 or Ap horizon ranges from very dark brown to very dark grayish brown in color and from 10 to 16 inches in thickness. The B horizon is dark brown to yellowish brown. In some areas the lower part of the B horizon is not mottled. In most places the solum is between 45 and 70 inches thick. Most of the solum formed in loess. The lower part of the B horizon is light clay loam to light sandy clay loam or sandy loam. In most places the IIC horizon, at a depth greater than that described in the typical profile, is sandy loam, silt loam, or loam. In some areas there are thin layers of loamy sand to sand.

Plano soils are better drained than Elburn soils. They contain less sand at depths between 30 and 40 inches than Proctor soils, but they contain more sand in the lower part of the subsoil than Catlin soils.

Plano silt loam, 1 to 4 percent slopes (199B).—This soil occupies small, narrow breaks toward drainageways in areas where the topography is nearly level, and on side slopes in areas where the topography is undulating. Included in mapping were a few small areas where loamy sand occurs below a depth of 50 inches and areas where the surface layer is thinner.

Surface runoff is medium, and the erosion hazard is moderate.

Most areas are used for crops, but the soil is also well suited to pasture. Control of erosion is a necessary part of good management. (Management group IIe–1)

Proctor Series

This series consists of deep, gently sloping, moderately well drained and well drained soils. Most areas are in the eastern part of the country where the topography is undulating and gently rolling. These soils formed in thin deposits of loess and the underlying sandy loam, loam, or silt loam outwash.

In a typical profile the surface layer is very dark brown to very dark grayish-brown silt loam about 10 inches thick.

The subsoil, about 26 inches thick, is dark brown to dark yellowish brown. The upper part is firm silty clay loam, and the lower part is firm clay loam to sandy clay loam.

The underlying material is brown, friable, stratified loam, sandy loam, and silt loam.

Permeability is moderate, and the available moisture capacity is high. The content of phosphorus is low to medium, and the content of potassium is medium to high. The soils are slightly acid to medium acid.

Most areas are used for crops, chiefly corn and soybeans. All the commonly grown crops are suited. Artificial drainage is not needed. A few areas are used for pasture.

Typical profile of Proctor silt loam, 1 to 4 percent slopes, in a virgin area, in a roadbank across the road from farm driveway in the NE. corner of NW¼-SE¼ sec. 17, T. 15 N., R. 14 W.

A1—0 to 6 inches, very dark brown (10YR 2/2) silt loam; moderate, fine and medium, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A3—6 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine and medium, granular structure; friable; abundant roots; slightly acid; clear, smooth boundary.

B1—10 to 13 inches, dark-brown (10YR 4/3) light silty clay loam; weak, very fine, subangular blocky structure to moderate, medium, granular; friable to firm; plentiful roots; medium acid; clear, smooth boundary.

B21t—13 to 20 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, very fine and fine, subangular blocky structure to angular blocky; firm; plentiful roots; thin, discontinuous, dark-brown (10YR 3/3) clay films; medium acid; clear, smooth boundary.

B22t—20 to 25 inches, dark yellowish-brown (10YR 4/4, 85 percent) silty clay loam; common, medium, faint mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; few roots; some sand grains; thin, discontinuous, dark-brown (10YR 3/3) clay films; medium acid; clear, wavy boundary.

IIB3—25 to 36 inches, brown (10YR 4/3) light clay loam to sandy clay loam; common, coarse, faint mottles of yellowish brown (10YR 5/4); weak, coarse, subangular blocky structure; firm, few rounded pebbles; slightly acid; abrupt, smooth boundary.

IIC—36 to 60 inches, brown (10YR 4/3) stratified sandy loam, loam, and silt loam; common, fine, faint, yellowish-brown (10YR 5/4) mottles; massive; friable; no roots; neutral.

The A horizon ranges from very dark brown to very dark grayish brown in color and from 10 to 15 inches in thickness. The upper part of the B horizon is silty clay loam and ranges from dark brown to yellowish brown in color. The lower part is clay loam or sandy clay loam and ranges from dark yellowish brown to brown. In some places it is free of mottles. The solum ranges from 35 to 50 inches in thickness. The IIC horizon is stratified sandy loam, loam, or silt loam in most places. In a few places this horizon contains a thin layer of silty clay loam or loamy sand.

Proctor soils are better drained than Brenton soils. They lack an A2 horizon, a layer that is characteristic of Harvard soils. Proctor soils contain more sand at depths between 30 and 40 inches than Plano soils.

Proctor silt loam, 1 to 4 percent slopes (148B).—This soil occupies small to medium-size, irregularly shaped areas on side slopes where the topography is undulating. It also occurs on ridgetops where the topography is gently rolling. Included in mapping were a few small areas where the surface layer is thin or where loamy sand occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is moderate. The organic-matter content is high.

Most areas are used for crops, but the soil is also well suited to pasture. Control of erosion is a necessary part of good management. (Management group IIe–1)

Raub Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils occur throughout the county except in lakebed and timbered areas. They formed in thin deposits of loess and the underlying loam glacial till. The topography is level to undulating.

In a typical profile the surface layer is black silt loam about 16 inches thick.

The subsoil is about 30 inches thick. The uppermost part is dark grayish-brown, firm silty clay loam mottled with yellowish brown. The middle part is brown, firm clay loam mottled with yellowish brown and grayish brown. The lower part is mottled, light olive-brown, friable clay loam.

The underlying material is mixed grayish-brown and light olive-brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is medium to high. The soils are medium acid to slightly acid.

Nearly all areas are cultivated. Corn and soybeans are the main crops. Some areas are too wet for cultivation in spring. Drained areas are well suited to all the commonly grown crops.

Typical profile of Raub silt loam, 0 to 2 percent slopes, in a cultivated field, 30 feet west of the center of the road and 425 feet south of the NE. corner of SE¼ sec. 13, T. 14 N., R. 9 E.

Ap—0 to 7 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; abrupt, smooth boundary.

A1—7 to 16 inches, black (10YR 2/1) silt loam; moderate, fine and medium, granular structure; friable; plentiful roots; medium acid; clear, smooth boundary.

B1—16 to 19 inches, very dark grayish-brown (10YR 3/2) light silty clay loam; moderate, very fine, subangular blocky structure; friable; plentiful roots; thick, continuous, black (10YR 2/1) organic coatings; medium acid; clear, smooth boundary.

B21—19 to 30 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; firm; few roots; continuous, very dark grayish-brown (10YR 3/2) clay films; medium acid; clear, smooth boundary.

IIB22t—30 to 40 inches, brown (10YR 4/3) clay loam; common, fine, faint mottles of yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2); moderate, medium, subangular blocky structure; firm; few small pebbles; few roots; thin, continuous, very dark grayish-brown (10YR 3/2) clay films; slightly acid; clear, smooth boundary.

IIB3—40 to 46 inches, light olive-brown (2.5Y 5/4) light clay loam; many, medium, faint mottles of grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; friable; few small pebbles; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films; few roots; neutral; clear, smooth boundary.

IIC—46 to 60 inches, mixed grayish-brown (2.5Y 5/2) and light olive-brown (2.5Y 5/4) heavy loam; massive; no roots; few small pebbles; strongly calcareous.

The A horizon ranges from 12 to 20 inches in thickness. The Ap horizon is black to very dark grayish brown. The B and C horizons are brown to light olive brown mottled with yellowish brown to grayish brown. In most places the solum ranges from 40 to 60 inches in thickness. The loess deposits range from 18 to 40 inches in thickness.

Raub soils are better drained than Drummer soils, but they are not so well drained as Dana soils. They lack an A2 horizon, a layer that is characteristic of Toronto soils. They contain more sand in the B2 horizon than Flanagan soils.

Raub silt loam, 0 to 2 percent slopes (481A).—This soil occupies small to medium-size, slightly elevated areas where the topography is nearly level. It also occurs on ridgetops where the topography is undulating. It has the profile described as typical of the series. Included in mapping were a few small areas where the solum is thinner.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are used for crops. The soil is also well suited to pasture. Providing adequate drainage is a minor problem in some areas. (Management group I–2).

Raub silt loam, 2 to 4 percent slopes (481B).—This soil occupies small, narrow breaks toward drainageways in areas where the topography is nearly level. It also occurs on irregularly shaped side slopes in areas where the topography is undulating. The profile is similar to that described as typical of the series, except that the surface layer is lighter colored and thinner. Included in mapping were a few small areas of moderately well drained soils.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops and pasture, and most areas are used for crops. Control of erosion is a necessary part of good management. In some areas providing adequate drainage is a minor problem. (Management group IIe–3).

Ridgeville Series

This series consists of deep, nearly level, somewhat poorly drained soils. These soils occur mainly on slopes in the southeastern part of the county where the topography is undulating. They formed in sandy loam outwash.

In a typical profile the surface layer is black to very dark brown fine sandy loam to light loam about 18 inches thick.

The subsoil, about 32 inches thick, is dark-brown to light olive-brown, friable sandy loam to clay loam mottled with grayish brown and strong brown.

The underlying material is light yellowish-brown, loose fine sand mottled with light gray.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate. The organic-matter content is high. The content of phosphorus is low, and the content of potassium is medium. The soils are medium acid to slightly acid.

Most areas are cultivated. Some areas are too wet in spring for crops to make good growth. Drained areas are suited to most of the commonly grown crops. During dry periods the available moisture capacity is inadequate.

Typical profile of Ridgeville fine sandy loam, in a cultivated field, 15 feet south of road right-of-way and 1,040 feet SE. of the corner of the road, SW¼-SW¼ sec. 9, T. 14 N., R. 10 E.

Ap—0 to 7 inches, black (10YR 2/1) fine sandy loam; weak, very fine, granular structure; very friable; plentiful roots; neutral; clear, smooth boundary.

A1—7 to 14 inches, black (10YR 2/1) fine sandy loam; weak, very fine and fine, granular structure; very friable; few roots; neutral; clear, smooth boundary.

A3—14 to 18 inches, very dark brown (10YR 2/2) light loam; weak, very fine and fine, granular structure; very friable; few roots; slightly acid; clear, smooth boundary.

B1t—18 to 22 inches, very dark grayish-brown (2.5Y 3/2) loam; common, fine, faint mottles of dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2); weak, fine and medium, subangular blocky structure; friable; few roots; medium acid; abrupt, smooth boundary.

B21t—22 to 26 inches, dark-brown (10YR 4/3) light clay loam; many, fine, faint mottles of grayish brown (10YR 5/2) and common, medium, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; few roots; medium acid; clear, smooth boundary.

B22t—26 to 34 inches, light olive-brown (2.5Y 5/4) heavy sandy loam to light sandy clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, medium and coarse, subangular blocky structure; friable; few roots; accumulations of light olive-gray (5Y 6/2) sand grains on ped faces; medium acid; clear, smooth boundary.

B23t—34 to 44 inches, light olive-brown (2.5Y 5/4) light sandy clay loam; many, coarse, faint mottles of grayish brown (2.5Y 5/2) and many, coarse, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, subangular blocky structure; friable; few roots; accumulations of light olive-gray (5Y 6/2) sand grains on ped faces; medium acid; clear, smooth boundary.

B3—44 to 50 inches, grayish-brown (2.5Y 5/2) sandy loam; many, coarse, prominent mottles of strong brown (7.5YR 5/8); structureless to weak, coarse, subangular blocky structure; friable; no roots; slightly acid; abrupt, smooth boundary.

C—50 to 60 inches, light yelllowish-brown (2.5Y 6/4) fine sand; common, coarse, distinct mottles of light gray (2.5Y 7/2); single grain; loose; no roots; mildly alkaline.

The A horizon ranges from black to very dark brown in color and from 12 to 20 inches in thickness. In most places it is fine sandy loam, but in some areas it ranges to loam. The B horizon is dark brown to light olive brown mottled with grayish brown to strong brown. It ranges from sandy loam to light clay loam or light sandy clay loam in texture. The solum ranges from 35 to 60 inches in thickness. The C horizon ranges from loamy fine sand to sand that contains lenses of fine sandy loam in some places.

Ridgeville soils contain more sand throughout the profile than Brenton soils. They are not so well drained as Alvin soils, and the have a darker colored surface layer than those soils.

Ridgeville fine sandy loam (151).—This soil occupies small, irregularly shaped, widely scattered areas where the topography is nearly level. Included in mapping were a few small areas where the subsoil is sandy clay loam or clay loam, or where loam to silty clay loam occurs below a depth of 45 inches. Also included were areas of better drained soils.

Surface runoff is slow, and the erosion hazard is slight.

This soil is used mainly for crops. It is also well suited to pasture. Droughtiness is a problem in dry periods. In some areas artificial drainage is needed in wet periods. (Management group I–2)

Russell Series

This series consists of deep, moderately sloping and strongly sloping, well-drained soils. These soils are in areas along the Embarras and Kaskaskia Rivers where the topography is rolling. They formed in thin deposits of loess and the underlying loam glacial till.

In a typical profile the plow layer is dark-brown and brown silt loam about 6 inches thick.

The subsoil is about 52 inches thick and is firm. The uppermost part is brown silty clay loam. The middle part is dark-brown clay loam mottled with yellowish brown. The lower part is dark grayish-brown clay loam mottled with light brownish gray and yellowish brown.

The underlying material is olive-brown loam mottled with strong brown. It consists of friable, calcareous glacial till.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are medium acid to strongly acid.

Many areas have been cleared and are used for crops or pasture. Most of the commonly grown crops are suited. Control of erosion and regular fertilization are important. Artificial drainage is not needed. Uncleared areas are used for woodland.

Typical profile of Russell silt loam, 4 to 7 percent slopes, eroded, in a cultivated field, 150 feet east and 600 feet north of the east-west road in SW¼NE¼ sec. 2, T. 14 N., R. 10 E.

Ap—0 to 6 inches, dark-brown (10YR 4/3, 80 percent) and brown (10YR 5/3, 20 percent) silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—6 to 10 inches, brown (7.5YR 4/4) light silty clay loam; strong, fine, subangular blocky structure; friable to firm; thin, nearly continuous, brown (10YR 5/3) silt coatings; strongly acid; clear, smooth boundary.

B21t—10 to 19 inches, brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm; thin, dark-brown (10YR 4/3) clay films; strongly acid; gradual, smooth boundary.

B22t—19 to 30 inches, brown (7.5YR 4/4) silty clay loam; strong, medium and coarse, subangular blocky structure; firm; thin, dark-brown (7.5YR 4/4) clay films; strongly acid; clear, smooth boundary.

IIB23t—30 to 42 inches, dark-brown (10YR 4/3) clay loam; common, coarse, distinct mottles of pale brown (10YR 6/3) and dark yellowish brown (10YR 4/4); weak to moderate, coarse, angular and subangular blocky structure; firm; numerous black (10YR 2/1) iron-manganese concretions; medium acid; gradual, smooth boundary.

IIB3–42 to 58 inches, dark grayish-brown (2.5Y 4/2) light clay loam; common, medium, faint mottles of light brownish gray (2.5Y 6/2) and few, fine, prominent mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm, few iron-manganese concretions; moderately alkaline; clear, smooth boundary.

IIC—58 to 60 inches, olive-brown (2.5Y 4/4) heavy loam; few, medium, prominent mottles of strong brown (7.5YR 5/8); massive; friable; calcareous.

The A horizon ranges from 4 to 9 inches in thickness. The Ap horizon ranges from dark grayish brown to brown in color. If an A2 horizon is present, it ranges from grayish brown to pale brown. In most areas the B horizon is brown to dark grayish brown. The loess deposits range from 18 to 40 inches in thickness. In most areas the solum ranges from 42 to 60 inches in thickness.

Russell soils are better drained than Xenia soils and are deeper to calcareous glacial till than Miami soils.

Russell silt loam, 4 to 7 percent slopes, eroded (322C2).—This soil occupies small to medium-size, irregularly shaped side slopes near more sloping soils. It also occurs as long, narrow areas adjacent to drainageways. It has the profile described as typical of the series. Included in mapping were a few small areas where the surface layer is darker colored. The included areas make up less than 8 percent of the acreage.

Surface runoff is rapid, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, or woodland. Control of erosion is a necessary part of good management. Maintaining tilth is a minor problem. (Management group IIe–2)

Russell silt loam, 7 to 12 percent slopes, eroded (322D2).—This soil is on long, narrow breaks near alluvial soils or on side slopes along drainageways. Included in mapping were a few areas where the solum is thinner than is typical.

Surface runoff is rapid, and the erosion hazard is severe.

This soil is suited to crops if erosion is adequately controlled. It is also suited to pasture or woodland. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IIIe–1)

Russell soils, 4 to 7 percent slopes, severely eroded (322C3).—These soils occupy long, narrow areas adjacent to drainageways or small, irregularly shaped areas near more sloping soils. They have a profile similar to that described as typical of the series, except that the plow layer consists mostly or entirely of brown silty clay loam or light silty clay loam subsoil material. Included in mapping were a few small areas where the solum is thinner.

Surface runoff is rapid, and the erosion hazard is severe.

These soils are suited to pasture, woodland, or crops if erosion is adequately controlled. Control of erosion and maintenance of tilth are necessary parts of good management. (Management group IIIe–1)

Rutland Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils in the lakebed areas. These soils formed mainly in moderately thick deposits of loess but partly in the underlying silty clay and clay lakebed sediments.

In a typical profile the surface layer is black silt loam about 13 inches thick.

The subsoil, about 34 inches thick, is mottled, light olive-brown to dark grayish-brown, firm silty clay loam.

The underlying material is mixed light olive-brown and gray, stratified silty clay and clay. It consists of firm, calcareous lakebed sediments.

Permeability is moderately slow, and the available moisture capacity is high. The organic-matter content is high. The content of phosphorus is low to medium, and the content of potassium is high. The soils are slightly acid to neutral.

Most areas are cultivated. Corn and soybeans are the main crops, but all the commonly grown crops are suited. In some areas these soils are too wet in spring for good crop growth. A few areas are used for pasture.

Typical profile of Rutland silt loam, 2 to 4 percent slopes, 1,250 feet south of road bridge and 110 feet east of the center of the road in SW¼NW¼ sec. 19, T. 15 N., R. 9 E.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium and coarse, granular structure; friable; plentiful roots; medium acid; clear, smooth boundary.

A1—8 to 13 inches, black (10YR 2/1) silt loam; moderate, fine and medium, granular structure; friable; few roots; slightly acid; clear, smooth boundary.

B1—13 to 17 inches, grayish-brown (2.5Y 5/2) light silty clay loam; common, fine, faint mottles of light olive brown (2.5Y 5/6); moderate, very fine and fine, subangular blocky structure; friable to firm; few roots; black (10YR 2/1) organic coatings; slightly acid; clear, smooth boundary.

B21t—17 to 25 inches, dark grayish-brown (2.5Y 4/2) heavy silty clay loam; many, medium, faint mottles of light olive brown (2.5Y 5/4) and common, medium, distinct mottles of yellowish brown (10-YR 5/6); moderate, fine and medium, subangular blocky structure; firm; few roots; continuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; slightly acid; clear, smooth boundary.

B22t—25 to 36 inches, light olive-brown (2.5Y 5/4) heavy silty clay loam; many, medium and coarse, distinct mottles of olive yellow (2.5Y 6/6); moderate, medium and coarse, subangular blocky structure; firm; few roots; continuous, dark grayish-brown (10YR 4/2) clay films; many iron-manganese concretions; neutral; clear, smooth boundary.

B31—36 to 41 inches, grayish-brown (2.5Y 5/2) light silty clay loam; many, medium and coarse, distinct mottles of light olive brown (2.5Y 5/6); moderate, coarse, subangular blocky structure; friable to firm; few roots; moderately thick, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; moderately alkaline; clear, smooth boundary.

IIB32—41 to 47 inches, olive-gray (5Y 5/2) silty clay loam; common, medium, distinct mottles of olive (5Y 5/6); weak, coarse, subangular blocky structure; friable to firm; no roots; thin, discontinuous, grayish-brown (10YR 5/2) clay films; few iron-manganese concretions; very strongly calcareous; abrupt, smooth boundary.

IIC—47 to 60 inches, mixed light olive-brown (2.5Y 5/4) and gray (5Y 5/1), stratified silty clay and clay; massive; firm; no roots; soft, light-gray (2.5Y 7/2) calcium carbonate concretions; very strongly calcareous.

The A horizon ranges from black to very dark gray in color and from 10 to 15 inches in thickness. The B horizon is mottled dark grayish brown to light olive brown.

Most of the solum formed in loess, but the lower part formed in lakebed sediments. In most places the texture of the subsoil is heavy silty clay loam. The solum ranges from 35 to 55 inches in thickness. The IIC horizon is silty clay or clay. In some areas the underlying material is stratified with thin layers of sandy loam to silty clay loam sediments.

Rutland soils have a darker colored surface layer than Kernan soils. They contain more clay in the IIC horizon than Flanagan soils.

Rutland silt loam, 0 to 2 percent slopes (375A).—This soil occupies small to large, irregularly shaped, slightly elevated positions where the topography is nearly level. Included in mapping were small areas where as much as 6 inches of loamy material overlies the lakebed sediments.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops and pasture. Artificial drainage is needed in a few areas. (Management group IIw-1)

Rutland silt loam, 2 to 4 percent slopes (375B).—This soil occupies small and medium-size, narrow side slopes. It has the profile described as typical of the series. Included in mapping were a few areas where as much as 6 inches of loamy material overlies the lakebed sediments.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops and pasture. Control of erosion is a necessary part of good management. Artificial drainage is needed in a few areas. (Management group IIe-3)

Sabina Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils are in areas near the major streams where the topography is level to undulating. They formed in moderately thick deposits of loess and the underlying loam glacial till.

In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 4 inches thick, is grayish-brown silt loam.

The subsoil is dark grayish-brown to light olive-brown, firm silty clay loam mottled with yellowish brown to a depth of about 43 inches. In the next 7 inches it is mixed yellowish brown and light olive brown.

The underlying material is mixed olive-gray and olive loam. It consists of friable, calcareous glacial till.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is high. The soils are medium acid to slightly acid.

Many areas have been cleared of trees and are cultivated. Corn and soybeans are the main crops. Some areas are too wet for crops to make good growth. If adequately drained, these soils are suited to all the commonly grown crops. Some areas are used for woodland or pasture.

Typical profile of Sabina silt loam, 0 to 2 percent slopes, in a cultivated field, 36 feet east of the center of the road and 100 feet south of the center of farm lane on west side of road, or 285 feet north of fence, or 465 feet north of the SW. corner of NW¼SW¼ sec. 13, T. 16 N., R. 7 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—8 to 12 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine, granular structure; friable; few small iron-manganese concretions; strongly acid; clear, smooth boundary.

B1—12 to 16 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; common, fine, distinct mottles of dark grayish brown (2.5Y 4/2); moderate, very fine, subangular blocky structure; firm; few iron-manganese concretions; medium acid; clear, smooth boundary.

B21t—16 to 25 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, fine and medium, subangular blocky structure; firm; thick, continuous, dark-gray (10YR 4/1) clay films; few iron-manganese concretions; medium acid; clear, smooth boundary.

B22t—25 to 37 inches, dark grayish-brown (2.5Y 4/2) heavy silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; few iron-manganese concretions; thick, continuous, very dark gray (10YR 3/1) clay films; slightly acid; clear, smooth boundary.

B23t—37 to 43 inches, light olive-brown (2.5Y 5/4) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2); weak to moderate, medium and coarse, subangular blocky structure; firm; discontinuous, very dark grayish-brown (10YR

3/2) clay films; few iron-manganese concretions; neutral; clear, smooth boundary.

IIB3—43 to 50 inches, mixed yellowish-brown (10YR 5/4), light olive-brown (2.5Y 5/4), and dark grayish-brown (10YR 4/2) clay loam; weak, coarse, subangular blocky structure; firm; discontinuous, very dark grayish-brown (10YR 3/2) clay films; neutral; gradual, smooth boundary.

IIC—50 to 60 inches, mixed olive-gray (5Y 4/2) and olive (5Y 5/4) heavy loam; massive; firm; few iron-manganese concretions; few small pebbles; strongly calcareous.

The A horizon ranges from 8 to 16 inches in thickness. In most places the Ap horizon ranges from dark grayish brown to grayish brown in color, and the A2 horizon from grayish brown to pale brown. The B horizon is dark grayish brown to light olive brown mottled with yellowish brown. The solum ranges from 40 to 55 inches in thickness.

Sabina soils contain less sand in the subsoil than Fincastle soils. They have a lighter colored surface layer than Sunbury soils.

Sabina silt loam, 0 to 2 percent slopes (236A).—This soil occupies small to medium-size, irregularly shaped, slightly elevated areas where the topography is nearly level. It also occurs on small, irregularly shaped ridgetops where the topography is undulating. It has the profile described as typical of the series. Most of the subsoil formed in loess, but in some places as much as 6 inches of loam or sandy loam outwash occurs between the loess and the glacial till.

Surface runoff is medium, and the erosion hazard is slight.

Most areas are used for crops. This soil is also well suited to pasture or woodland. Providing adequate drainage and maintaining tilth are necessary parts of good management. (Management group IIw–1)

Sabina silt loam, 2 to 4 percent slopes (236B).—This soil occurs on small, narrow breaks toward drainageways where the topography is nearly level or on small, irregular side slopes where the topography is undulating. Most of the subsoil formed in loess, but in some places as much as 6 inches of loam or sandy loam outwash occurs between the loess and the glacial till.

Surface runoff is medium, and the erosion hazard is moderate.

Most areas are used for crops. This soil is also well suited to pasture or woodland. Controlling erosion, providing adequate drainage, and maintaining tilth are necessary parts of good management. (Management group IIe–4)

St. Charles Series

This series consists of deep, level to gently sloping, moderately well drained and well drained soils. These soils are mainly in the eastern part of the county near the major streams, where the topography is level to undulating. They formed in moderately thick deposits of loess and the underlying sandy loam, loam, or silt loam outwash.

In a typical profile the surface layer is dark grayish-brown silt loam about 4 inches thick. The subsurface layer, about 7 inches thick, is brown silt loam. In cultivated areas the surface layer and the upper part of the subsurface layer are mixed.

The subsoil is more than 48 inches thick. The uppermost part is brown or yellowish-brown, firm silty clay loam. The middle part is brown, firm silty clay loam with light olive-brown mottles. The lower part is mixed brown and yellowish-brown, friable, stratified clay loam, sandy loam, and sandy clay loam.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is high. The soils are slightly acid to medium acid.

Most areas have been cleared and are cultivated. Corn and soybeans are the main crops, but all the commonly grown crops are suited. Artificial drainage is not needed. A few areas are used for woodland or pasture.

Typical profile of St. Charles silt loam, 1 to 4 percent slopes, in a virgin area, in the east roadbank, 220 feet northeast of the curve of the road on the southern boundary of NE¼ sec. 4, T. 15 N., R. 9 E.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine and medium, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A2—4 to 11 inches, brown (10YR 4/3) silt loam; weak, medium, granular structure; friable; plentiful roots; slightly acid; clear, smooth boundary.

B1—11 to 14 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; weak, fine, subangular blocky structure; few roots; slightly acid; clear, smooth boundary.

B21t—14 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few roots; few iron-manganese concretions; slightly acid; gradual, smooth boundary.

B22t—23 to 36 inches, brown (10YR 5/3) silty clay loam; many, medium, distinct mottles of light olive brown (2.5Y 5/4) and common, coarse, faint mottles of yellowish brown (10YR 5/6); moderate, coarse, subangular blocky structure; firm; yellowish-brown (10YR 5/4) coatings on peds; medium acid; clear, smooth boundary.

B31—36 to 42 inches, brown (10YR 5/3) light silty clay loam; many, medium, faint mottles of olive brown (2.5Y 4/4); weak to moderate, coarse, subangular blocky structure; firm; discontinuous coatings of yellowish brown (10YR 5/4); medium acid; clear, smooth boundary.

IIB32—42 to 60 inches, mixed brown (10YR 5/3, 60 percent) and yellowish-brown (10YR 5/4, 40 percent) stratified clay loam, sandy loam, and sandy clay loam; weak, coarse, subangular blocky structure; some brown (10YR 5/3) clay films on vertical faces; friable; medium acid.

The A horizon ranges from 10 to 16 inches in thickness. The A1 horizon, or in cultivated areas the Ap horizon, is dark grayish brown to brown. The B horizon is dark brown to yellowish brown. The lower part is free of mottles in some areas. The B3 horizon, if formed in outwash material, ranges from light clay loam or light sandy clay loam to loam or sandy loam. In some areas it is stratified with thin layers of loamy sand or sand. The solum ranges from 45 to more than 60 inches in thickness.

St. Charles soils are better drained than Kendall soils. They have less sand in the B22t horizon than Camden soils.

St. Charles silt loam, 1 to 4 percent slopes (243B).—This soil occupies small to medium-size, irregularly shaped areas in moderately elevated positions. Included in mapping were a few areas where loamy sand occurs below a depth of 50 inches or where the subsoil is mottled.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, or woodland. Control of erosion is necessary. Maintenance of tilth is a minor problem. (Management group IIe–2)

Sawmill Series

This series consists of deep, level to nearly level, poorly drained and very poorly drained soils on bottom lands along major streams. These soils formed in alluvium of silty clay loam texture.

In a typical profile the surface layer is mainly black, firm silty clay loam about 31 inches thick. The subsoil, 29 inches or more in thickness, is mainly dark-gray to gray, firm silty clay loam mottled with light olive brown. The lower few inches is gray and light olive brown.

Permeability is moderate to a depth of about 30 inches, but it is moderate to moderately slow below that depth. The available moisture capacity is very high. The organic-matter content is very high. The content of phosphorus is medium, and the content of potassium is medium to high. Unless tile drainage is provided, the water table is at or near the surface most of the year. The soils are slightly acid to neutral.

Drained areas are cultivated. Most of the commonly grown crops are suited. Undrained areas are used for pasture or woodland.

Typical profile of Sawmill silty clay loam, in a cultivated field, 95 feet north of bridge and 45 feet east of the center of the road, NW¼SW¼ sec. 7, T. 15 N., R. 9 E.

Ap—0 to 7 inches, very dark brown (10YR 2/2) light silty clay loam; moderate, fine, granular structure; firm; abundant roots; slightly acid; abrupt, smooth boundary.

A11—7 to 17 inches, black (10YR 2/1) silty clay loam; moderate, medium, granular structure and moderate, fine, subangular blocky; firm; plentiful roots; slightly acid; gradual, smooth boundary.

A12—17 to 25 inches, black (10YR 2/1) silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; slightly acid; gradual, smooth boundary.

A3—25 to 31 inches, very dark gray (10YR 3/1) silty clay loam; moderate, fine, subangular blocky structure; firm; few roots; continuous, black (10YR 2/1) organic coatings on peds; slightly acid; clear, smooth boundary.

B21g—31 to 42 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, faint mottles of dark grayish brown (10YR 4/2); moderate, fine, subangular blocky and angular blocky structure; firm; few roots; thick, continuous, very dark gray (10YR 3/1) organic-clay coatings; neutral; clear, smooth boundary.

B22g—42 to 54 inches, dark-gray (5Y 4/1) silty clay loam; many, medium, distinct mottles of light olive brown (2.5Y 5/4); weak, medium and coarse, subangular blocky structure; firm; few roots; continuous, gray (5Y 5/1) clay coatings; neutral; clear, smooth boundary.

B3g—54 to 60 inches, mixed gray (5Y 5/1) and light olive-brown (2.5Y 5/6) silty clay loam; weak, coarse, subangular blocky structure; firm; no roots; neutral.

The thickness of the dark-colored material ranges from 24 to 40 inches. The A horizon is black to very dark gray, and is more commonly very dark gray in the lower part. The B horizon is dark gray to grayish brown. In some areas the soil below a depth of 40 inches is clay loam. In many places it is stratified with loam or silt loam.

Sawmill soils contain less clay than Peotone or Wabash soils. They contain more clay than Lawson soils, and they are not so well drained.

Sawmill silty clay loam (107).—This soil occurs mainly as long, narrow, medium-size areas on bottom lands. It has the profile described as typical of the series. Included in mapping were a few areas that have a thinner surface layer, a loamy subsoil, or recent deposition of silt loam.

Surface runoff is slow, and there is no erosion hazard. Some areas are flooded for short periods early in spring.

This soil is well suited to crops and pasture. Providing adequate drainage, maintaining tilth, and controlling flooding are serious management problems. (Management group IIw–4)

Sawmill silty clay loam, wet (W107).—This soil occurs on most of the bottom lands in the county. Included in mapping were a few small areas that have a thinner surface layer or a loamy subsoil.

Surface runoff is very slow, and there is no erosion hazard. The areas are frequently flooded.

This soil is better suited to pasture than to other uses. Providing adequate drainage, controlling flooding, and maintaining tilth are the major concerns in managing this soil. (Management group Vw–1)

Sexton Series

This series consists of deep, level to nearly level, poorly drained soils. These soils are near the Embarras River. They formed in thin deposits of loess and the underlying sandy loam, loam, and silt loam outwash. The topography is nearly level.

In a typical profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer, about 8 inches thick, is grayish-brown, very firm silt loam.

The subsoil is chiefly light gray to gray mottled with strong brown to yellowish brown. It is about 35 inches thick. The uppermost 4 inches is firm light silty clay loam. Below this is firm heavy silty clay loam. The lower part is friable to firm clay loam.

The underlying material is mixed dark yellowish-brown, grayish-brown, and light olive-brown, friable sandy clay loam to sandy loam.

Permeability is slow. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium. The soils are very strongly acid to medium acid.

Most areas have been cleared and are used for crops. Unless the soils are artificially drained, the water table is at or near the surface most of the year. If adequately drained and fertilized, these soils are suited to all the commonly grown crops. A few areas are used for pasture or woodland.

Typical profile of Sexton silt loam, in a cultivated field, 25 feet west of the SE. corner of NE¼NE¼ sec. 9, T. 15 N., R. 9 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; abundant roots; medium acid; abrupt, smooth boundary.

A2—7 to 15 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, subangular blocky structure; very firm; few roots; few iron-manganese concretions; strongly acid; clear, wavy boundary.

B1—15 to 19 inches, grayish-brown (2.5Y 5/2) light silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6) and light gray (10YR 7/2); moderate, very fine, subangular blocky structure; firm; few roots; few soft iron-manganese concretions; strongly acid; clear, smooth boundary.

B21tg—19 to 33 inches, light-gray (5Y 6/1) heavy silty clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; firm; few roots; few soft iron-manganese concretions; thick, light brownish-gray (10YR 6/2) silica coatings on ped faces; very strongly acid; clear, smooth boundary.

B22tg—33 to 41 inches, light-gray (N 6/0) heavy silty clay loam; common, medium, faint mottles of gray (5Y 5/1) and many, coarse, prominent mottles of strong brown (7.5YR 5/6 and 5/8); moderate, fine and medium, subangular blocky structure; firm; few roots; few soft iron-manganese concretions; thin, discontinuous, light brownish-gray (10YR 6/2) silica coatings on ped faces; medium acid; abrupt, smooth boundary.

IIB3tg—41 to 50 inches, gray (5Y 5/1) clay loam; many, coarse, faint mottles of light olive gray (5Y 6/2) and many, coarse, prominent mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; friable to firm; no roots; slightly acid; clear, smooth boundary.

IIC—50 to 60 inches, mixed dark yellowish-brown (10YR 3/4 and 4/4), grayish-brown (2.5Y 5/2), and light olive-brown (2.5Y 5/4) sandy clay loam to sandy loam; massive; friable; no roots; slightly acid.

The A horizon ranges from 12 to 18 inches in thickness. The Ap horizon in most areas is dark grayish brown or grayish brown, and the A2 horizon is grayish brown to pale brown. In most places the B horizon is dark-gray to light olive-gray heavy silty clay loam or clay loam mottled with strong brown and olive brown. The solum ranges from 35 to 55 inches in thickness. In many places the IIC horizon is stratified. Some areas contain thin layers of loamy sand or sand.

Sexton soils are not so well drained as Kendall and Starks soils. They have a lighter colored surface layer than Brooklyn soils.

Sexton silt loam (208).—This soil occupies small and medium-size, irregularly shaped, low flats. Included in mapping were some areas where the underlying material is calcareous loam glacial till.

Surface runoff is slow, and there is no erosion hazard.

This soil is suited to crops, pasture, or woodland. The major concerns in management are the need for adequate drainage, the slow internal movement of water, and the need to maintain tilth. (Management group IIw–3)

Starks Series

This series consists of deep, level to nearly level, somewhat poorly drained soils. These soils occur mainly near the Embarras River and its major tributaries. They formed in thin deposits of loess and the underlying sandy loam, loam, or silt loam outwash. The topography is level to undulating.

In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is brown silt loam.

The subsoil, about 39 inches thick, is firm. The upper part is grayish-brown to brown silty clay loam mottled with yellowish brown. The lower part is grayish-brown silty clay loam to sandy clay loam mottled with olive gray and yellowish brown.

The underlying material is brown, friable sandy loam to loamy sand.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are medium acid to strongly acid.

Most areas have been cleared and are cultivated. Corn and soybeans are the main crops, but all the commonly grown crops are suited. Some areas are too wet for cultivation. A few areas are used for woodland or pasture.

Typical profile of Starks silt loam (0 to 2 percent slopes), 375 feet south and 40 feet east of NW. corner of sec. 15, T. 15 N., R. 9 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; plentiful roots; slightly acid; abrupt, smooth boundary.

A2—8 to 11 inches, brown (10YR 5/3) silt loam; few, fine, faint mottles of grayish brown (10YR 5/2) to light brownish gray (10YR 6/2); weak, thin, platy structure breaking readily to moderate, fine, granular; friable; few roots; medium acid; abrupt, smooth boundary.

B1t—11 to 15 inches, brown (10YR 5/3) light silty clay loam; few, fine, faint mottles of grayish brown (10YR 5/2) and few, fine, prominent mottles of dark brown (7.5YR 4/4); moderate, fine and medium, subangular blocky structure; thin, discontinuous, grayish-brown (10YR 5/2) clay films; firm; few roots; medium acid; clear, smooth boundary.

B21t—15 to 20 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) silty clay loam; common, fine, prominent mottles of strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; moderately thick, continuous, light brownish-gray (10YR 6/2) clay films; firm; few roots; strongly acid; clear, smooth boundary.

B22t—20 to 28 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; few roots; continuous, light brownish-gray (10YR 6/2) clay films; strongly acid; clear, smooth boundary.

IIB23t—28 to 36 inches, grayish-brown (10YR 5/2) silty clay loam with some sand; common, medium, distinct mottles of yellowish brown (10YR 5/6) and many, medium, distinct mottles of olive gray (5Y 5/2); moderate, medium and coarse, subangular blocky structure; firm; few roots; thin, discontinuous, light brownish-gray (10YR 6/2) clay films; few small, soft iron-manganese concretions; strongly acid; clear, smooth boundary.

IIB3—36 to 50 inches, grayish-brown (2.5Y 5/2, 60 percent) sandy clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6, 40 percent); weak, coarse, subangular blocky structure; firm; no roots; few small soft iron-manganese concretions;

medium acid to strongly acid; abrupt, smooth boundary.

IIC—50 to 60 inches, brown to dark-brown (10YR 4/3) stratified loamy sand, sandy loam, and loam; single grain or massive; friable; no roots; medium acid.

The A horizon ranges from 10 to 16 inches in thickness. The Ap horizon is dark grayish brown to grayish brown. The B horizon is silty clay loam or clay loam in the upper part and clay loam to sandy clay loam in the lower part. The solum ranges from 35 to 60 inches in thickness. In most areas the IIC horizon is neutral to medium acid. In some areas it is calcareous. The texture is loam, sandy clay loam, sandy loam, or silt loam to a depth of at least 4 feet, but in some areas loamy sand or sand occurs below a depth of 4 feet.

Starks soils have a lighter colored surface layer than Millbrook soils. They are not so well drained as Camden soils, but they are better drained than Sexton soils. Starks soils contain more sand in the subsoil than Kendall soils.

Starks silt loam (132).—This soil occupies small to large, irregularly shaped areas in slightly elevated positions or areas on broad flats. The slope range is dominantly 0 to 2 percent, but in places it is as much as 3 percent. Included in mapping were a few areas where loamy sand occurs below a depth of 40 inches or where loam glacial till occurs below a depth of 50 inches.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops, pasture, or woodland. Providing adequate drainage and maintaining tilth are important parts of good management. (Management group IIw–1)

Strawn Series

This series consists of deep, moderately steep to steep, well-drained soils. These soils are on breaks along the major streams. They formed in loam glacial till. The topography is hilly to steep.

In a typical profile the plow layer is dark grayish-brown silt loam about 7 inches thick.

The subsoil, about 9 inches thick, is dark yellowish-brown, firm to friable gritty silty clay loam to clay loam.

The underlying material is mixed yellowish-brown and grayish-brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to a depth of about 16 inches and moderate to moderately slow below that depth. The available moisture capacity is moderate to high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium. The soils are slightly acid to neutral to a depth of about 12 inches. They are calcareous below that depth.

Most areas are in woodland or pasture. A few areas are used for hay. These soils are better suited to grasses and legumes than to other crops. Most areas are too steep to be used for corn or soybeans. Artificial drainage is not needed.

Typical profile of Strawn silt loam, 12 to 18 percent slopes, eroded, in a cultivated field, 240 feet east and 300 feet south of the NW. corner of NE¼ sec. 28, T. 15 N., R. 10 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; clear, smooth boundary.

B2t—7 to 14 inches, dark yellowish-brown (10YR 4/4) gritty silty clay loam to clay loam; moderate, very fine and fine, subangular blocky structure; firm; plentiful roots; thin, discontinuous, dark-brown (10YR 4/3) clay films; few 1/8- to 1/2-inch pebbles; slightly acid; clear, smooth boundary.

B3—14 to 16 inches, dark yellowish-brown (10YR 4/4) light clay loam; weak, fine, subangular blocky structure; friable; few roots; few, thin, discontinuous, dark-brown (10YR 4/3) clay films; few 1/8- to 1/2-inch pebbles; slightly calcareous; abrupt, smooth boundary.

C—16 to 60 inches, mixed yellowish-brown (10YR 5/4 and 5/6) and grayish-brown (2.5Y 5/2) loam; massive; friable; few roots in upper part; few 1/8- to 1/2-inch pebbles; strongly calcareous.

The A horizon ranges from 4 to 8 inches in thickness. The Ap horizon ranges from dark grayish brown to brown in color and from loam to silt loam in texture. In some places there is an A2 horizon of grayish-brown to pale-brown loam to silt loam. The B horizon is at least 5 inches thick and is dark yellowish-brown to yellowish-brown clay loam to silty clay loam. The solum ranges from 10 to 24 inches in thickness. The C horizon ranges from mixed yellowish brown and grayish brown to dark yellowish brown.

Strawn soils contain less clay in the subsoil and underlying material than Nappanee soils. They are not so deep to calcareous glacial till as Miami soils.

Strawn silt loam, 12 to 18 percent slopes, eroded (224E2).—This soil occupies small, irregularly shaped areas near drainageways or long narrow breaks near bottom lands. It has the profile described as typical of the series. Included in mapping were a few small areas where the subsoil is a little thicker than is typical.

Surface runoff is very rapid, and the erosion hazard is very severe.

This soil is suited to hay, wheat, and a limited amount of corn and soybeans. It is also well suited to pasture or woodland. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IVe–1)

Strawn silt loam, 18 to 40 percent slopes, eroded (224F2).—This soil occupies long, narrow breaks near bottom lands. Included in mapping were a few areas where the subsoil is thicker than that of this soil or the surface layer is brown silty clay loam or clay loam. Also included were a few areas where the slope is less than 12 percent but the soil is severely eroded.

Surface runoff is very rapid, and the erosion hazard is very severe.

This soil is suited to pasture or woodland. Control of erosion is a serious problem in management. Maintenance of tilth is a minor problem. (Management group VIe–1)

Sunbury Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. These soils are near the major streams. They formed in moderately thick deposits of loess and the underlying loam glacial till. The topography is level to undulating.

In a typical profile the surface layer is very dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 4 inches thick, consists of brown silt loam.

The subsoil, to a depth of about 43 inches, is mainly brown to yellowish-brown, mottled heavy silty clay loam. It is firm to friable.

The underlying material is mixed grayish-brown and yellowish-brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is high. The soils are medium acid to slightly acid.

Most areas have been cleared and are cultivated. Corn and soybeans are the main crops. Some areas are too wet in spring for cultivation. If artificially drained where needed, these soils are well suited to all the commonly grown crops. A few areas are used for woodland or pasture.

Typical profile of Sunbury silt loam, 0 to 2 percent slopes, in a cultivated field, 50 feet south of the center of the road and 90 feet east of the NW. corner of SW¼SW¼ sec. 19, T. 16 N., R. 7 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; neutral to slightly acid; clear, smooth boundary.

A2—8 to 12 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; medium acid; clear, smooth boundary.

B1—12 to 15 inches, dark-brown (10YR 4/3) light silty clay loam; moderate, fine, subangular blocky structure; firm; silica coatings of pale brown (10YR 6/3) on ped faces; medium acid; clear, smooth boundary.

B21t—15 to 25 inches, brown (10YR 5/3) heavy silty clay loam; common, fine, distinct mottles of dark grayish brown (10YR 4/2) and few, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; continuous, very dark grayish-brown (10YR 3/2) clay films; few iron-manganese concretions; medium acid; clear, smooth boundary.

B22t—25 to 36 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; few, medium, prominent mottles of dark gray (10YR 4/1) and common, medium, faint mottles of yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm; continuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; slightly acid; clear, smooth boundary.

B23—36 to 43 inches, brown (10YR 5/3) light silty clay loam; many, moderate, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; friable; few dark grayish-brown (10YR 4/2) clay films; mildly alkaline; clear, smooth boundary.

IIB3—43 to 47 inches, grayish-brown (10YR 5/2) heavy loam to clay loam; many distinct mottles of yellowish brown (10YR 5/6); weak, coarse, subangular blocky structure; firm; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films; neutral; abrupt, smooth boundary.

IIC—47 to 60 inches, mixed grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) loam; massive; firm; strongly calcareous.

The A horizon ranges from 10 to 18 inches in thickness. The Ap horizon ranges from very dark brown to very dark grayish brown in color, and the A2 horizon from dark grayish brown to brown. In most places the B horizon is brown to grayish brown in the upper part and grayish brown to light olive brown in the lower part. Most of it is mottled. This horizon formed mostly on loess, but the lower part commonly formed in till. The solum ranges from 40 to 55 inches in thickness.

Sunbury soils have a darker colored surface layer than Sabina soils, and they have an A2 horizon, a layer that is lacking in Flanagan soils. They contain less sand at depths between 30 and 40 inches than Toronto soils. Sunbury soils are not so poorly drained as Brooklyn soils.

Sunbury silt loam, 0 to 2 percent slopes (234A).—This soil occupies medium-size, irregularly shaped, slightly elevated areas. It has the profile described as typical of the series. In some places as much as 10 inches of stratified outwash occurs between the loess and glacial till.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops, pasture, and woodland. Artificial drainage is needed in a few areas. (Management group I–2)

Sunbury silt loam, 2 to 4 percent slopes (234B).—This soil occupies small, irregularly shaped side slopes. In some places as much as 10 inches of stratified outwash occurs between the loess and glacial till.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, and woodland. Control of erosion is a necessary part of good management. Artificial drainage is needed in some areas. (Management group IIe–3)

Toronto Series

This series consists of deep, level to gently sloping, somewhat poorly drained soils. Most areas are in the southeastern part of the county. These soils formed in thin deposits of loess and the underlying loam glacial till. The topography is undulating.

In a typical profile the surface layer is very dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 5 inches thick, is dark grayish-brown silt loam.

The subsoil, about 30 inches thick, is firm to very firm. The upper part is chiefly dark grayish-brown silty clay loam mottled with brown. The lower part is mottled, light olive-brown silty clay loam and clay loam.

The underlying material is light olive-brown loam. It consists of friable, calcareous glacial till.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is medium. The content of phosphorus is low, and the content of potassium is medium to high. The soils are strongly acid to slightly acid.

Most areas are used for crops, chiefly corn and soybeans. In some places the soils are too wet for crops to make good growth during wet seasons. Drained areas are well suited to all the commonly grown crops. A few areas are sparsely wooded or are used for pasture.

Typical profile of Toronto silt loam, 0 to 2 percent slopes, in a cultivated field, 50 feet east of the center of the road and 50 feet south of the fourth utility pole north of the SW. corner of sec. 17, T. 14 N., R. 10 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; strongly acid; abrupt, smooth boundary.

A2—8 to 13 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine and fine, granular structure; friable; plentiful roots; root channels and wormholes filled with very dark grayish-brown (10YR 3/2) silt loam; strongly acid; clear, smooth boundary.

B1—13 to 18 inches, dark-brown (10YR 4/3) light silty clay loam; moderate, fine, granular structure to moderate, very fine, subangular blocky; firm; plentiful roots; strongly acid; clear, smooth boundary.

B21t—18 to 26 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; many, medium, distinct mottles of brown (10YR 5/3); moderate, fine, subangular blocky structure; very firm; few roots; thin, continuous, dark-gray (10YR 4/1) clay films; some light brownish-gray (10YR 6/2) silica coatings; few iron-manganese concretions; strongly acid; clear, smooth boundary.

IIB22t—26 to 36 inches, light olive-brown (2.5Y 5/4) silty clay loam with some sand; many, medium, faint mottles of light olive brown (2.5Y 5/6); moderate, medium, subangular blocky structure; very firm; few roots; few small pebbles; thick, continuous, dark-gray (10YR 4/1) clay films; few iron-manganese concretions; slightly acid; clear, smooth boundary.

IIB3t—36 to 43 inches, light olive-brown (2.5Y 5/4) clay loam; many, medium, faint mottles of light olive brown (2.5Y 5/6); weak, coarse, subangular blocky structure; firm; few roots; few small pebbles; few iron-manganese concretions; neutral; clear, smooth boundary.

IIC—43 to 60 inches, light olive-brown (2.5Y 5/4) loam; massive; friable; no roots; few small pebbles; calcareous.

The A horizon ranges from 10 to 18 inches in thickness. The Ap horizon ranges from very dark brown to very dark grayish brown in color. The A2 horizon ranges from dark grayish brown to grayish brown. The B and C horizons are dark brown to light olive brown mottled with brown to yellowish brown. The B horizon is silty clay loam in the upper part and clay loam in the lower part. In most areas the solum ranges from 40 to 55 inches in thickness.

Toronto soils have an A2 horizon, which is lacking in Raub soils. They have a darker colored A2 horizon than Fincastle soils. Toronto soils contain less sand in the lower part of the subsoil than Brenton soils and more sand at depths between 30 and 40 inches than Sunbury soils.

Toronto silt loam, 0 to 2 percent slopes (353A).—This soil occupies small to medium-size, irregularly shaped side slopes. It has the profile described as typical of the series. Included in mapping were a few small areas where the solum is thinner than is typical.

Surface runoff is medium, and the erosion hazard is slight.

This soil is well suited to crops or pasture. Some areas need additional drainage. This soil is also well suited to woodland. (Management group I–2)

Toronto silt loam, 2 to 4 percent slopes (353B).—This soil occupies small, irregularly shaped side slopes. Included in mapping were a few areas where the surface layer is thin. Also included were a few areas where the solum is thinner than that of this soil.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops and pasture. A few small areas need drainage. This soil is also well suited to woodland. Control of erosion is a necessary part of good management. (Management group IIe–3)

Wabash Series

This series consists of deep, level to nearly level, poorly drained and very poorly drained soils. These soils are on bottom lands in the central part of the county. They formed in silty clay alluvium.

In a typical profile the surface layer is very dark brown to black, firm silty clay about 33 inches thick. The underlying material is dark-gray, firm clay loam mottled with yellowish red.

Permeability is slow, and the available moisture capacity is high. The organic-matter content is very high. The content of phosphorus and potassium is medium to high. The soils are slightly acid to neutral.

Some areas are cultivated, but most areas are too wet for crops. The water table is at or near the surface most of the year. Most areas are used for pasture or woodland.

Typical profile of Wabash silty clay, wet, 100 feet north and 110 feet west of road bridge, SE¼NE¼ sec. 17, T. 15 N., R. 9 E.

A11—0 to 9 inches, mixed very dark brown (10YR 2/2, 80 percent) and very dark grayish-brown (10YR 3/2, 20 percent) silty clay; moderate, fine, granular structure; firm; abundant roots; neutral; clear, smooth boundary.

A12—9 to 23 inches, mixed very dark brown (10YR 2/2, 60 percent) and black (10YR 2/1, 40 percent) silty clay; moderate, fine, granular structure; firm; few roots; neutral; clear, smooth boundary.

A3—23 to 33 inches, very dark gray (10YR 3/1) silty clay; many, medium, faint mottles of dark gray (10YR 4/1) and many, fine, distinct mottles of dark reddish brown (5YR 3/4); weak, fine and medium, subangular blocky structure; firm; few roots; many soft iron-manganese concretions; neutral; clear, smooth boundary.

C—33 to 60 inches, dark-gray (5Y 4/1) clay loam; many, fine, prominent mottles of yellowish red (5YR 4/6); weak, coarse, subangular blocky structure; firm; few roots; neutral; gradual, smooth boundary.

The A horizon ranges from black to very dark gray in color and from 24 to 40 inches in thickness. In some areas as much as 10 inches of silt loam or silty clay loam recent deposition overlies the A horizon. In most areas the C horizon ranges from clay loam to silty clay in texture and in many places is stratified.

Wabash soils contain more clay, especially in the A3 horizon, than Sawmill and Peotone soils. They have a thicker surface layer than Milford soils.

Wabash silty clay, wet (W83).—This soil occupies long, narrow bottom-land areas near streams. Included in mapping were a few areas where as much as 12 inches of silt loam to silty clay loam deposition is on the surface.

Surface runoff is very slow, and flooding is a serious hazard. There is no erosion hazard. The internal movement of water is slow.

This soil is suited to pasture. Provision for adequate drainage, control of flooding, and maintenance of tilth are major concerns in management. (Management group Vw–1)

Xenia Series

This series consists of deep, gently sloping, moderately well drained soils along the Embarras and Kaskaskia Rivers. These soils formed in thin deposits of loess and the underlying loam glacial till. The topography is rolling.

In a typical profile the surface layer is dark grayish-brown silt loam about 4 inches thick. The subsurface layer, about 8 inches thick, is brown silt loam.

The subsoil is about 37 inches thick and is firm. The upper part is yellowish-brown silty clay loam. The lower part is dark-brown to brown silty clay loam and clay loam mottled with grayish brown.

The underlying material is brown loam mottled with dark brown and grayish brown. It consists of friable, calcareous glacial till.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are very strongly acid to medium acid.

Most areas have been cleared and are cultivated. Corn and soybeans are the main crops, but all the commonly grown crops are well suited. Artificial drainage is not needed. Uncleared areas are used for woodland or pasture.

Typical profile of Xenia silt loam, 2 to 4 percent slopes, in a virgin area, 100 feet north of the center of the road and 120 feet east of the SW. corner of NE¼SE¼ sec. 15, T. 14 N., R. 10 E.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine and fine, granular structure; friable; abundant roots; strongly acid; abrupt, smooth boundary.

A2—4 to 12 inches, brown (10YR 5/3) silt loam; weak, thick, platy structure breaking to moderate, fine, granular; friable; plentiful roots; strongly acid; clear, smooth boundary.

B1—12 to 16 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, very fine, subangular blocky structure; firm; plentiful roots; brown (10YR 5/3) silica coatings; very strongly acid; clear, smooth boundary.

B21t—16 to 24 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/6); moderate, fine and medium, subangular blocky structure; few roots; discontinuous, brown (10YR 5/3) silica coatings; very strongly acid; clear, smooth boundary.

IIB22t—24 to 41 inches, dark-brown (10YR 4/3) silty clay loam; many, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium and coarse, subangular blocky structure; firm; few roots; thin, continuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; few fine pebbles; strongly acid; clear, smooth boundary.

IIB3t—41 to 49 inches, brown (10YR 5/3) clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2); moderate, coarse, subangular blocky structure; firm; few roots; discontinuous, dark grayish-brown (10YR 4/2) clay films; few iron-manganese concretions; few small pebbles; slightly acid; clear, smooth boundary.

IIC—49 to 60 inches, brown (10YR 5/3) heavy loam; common, medium, faint mottles of dark brown (10YR 4/3) and common, medium, distinct mottles of grayish brown (2.5Y 5/2); massive; friable; no roots; calcareous.

The A horizon ranges from 10 to 16 inches in thickness. The A1 horizon ranges from dark grayish brown to very dark grayish brown in color, and the A2 horizon from grayish brown to pale brown. In cultivated areas the Ap horizon is dark grayish brown to grayish brown. The B horizon is yellowish brown to dark brown, and the lower part is mottled with grayish brown. The texture of the B horizon in the lower part ranges from silty clay loam to clay loam. The solum ranges from 40 to 60 inches in thickness.

Xenia soils are not so well drained as Russell soils, but they are better drained than Fincastle soils. They are deeper to calcareous glacial till than Miami soils.

Xenia silt loam, 2 to 4 percent slopes (291B).—This soil occupies small to medium-size, irregularly shaped side slopes where the topography is undulating. It also occurs on moderately sloping ridgetops. Included in mapping were a few small areas where the surface and subsurface layers are thin. Also included were a few areas where the solum is thinner than that of this soil.

Surface runoff is medium, and the erosion hazard is moderate.

This soil is well suited to crops, pasture, and woodland. Control of erosion is a necessary part of good management. Maintenance of tilth is a minor problem. (Management group IIe–2)

Use and Management of the Soils

This section contains information about the use and management of the soils of Douglas County for crops, woodland, wildlife, recreation, and engineering. It explains the system of capability classification used by the Soil Conservation Service and groups the soils according to their management needs. It also contains a table showing predicted yields of the principal crops grown in the county under two levels of management.

Use and Management of the Soils for Crops

Soils used for cultivated crops need management that will maintain good tilth, maintain or improve fertility, remove excess water, and provide protection from erosion (*16*). Following are general practices of management that apply to many soils of the county.

Tillage practices.—Frequent tillage destroys soil structure. It also produces a powdery surface layer that crusts and will not absorb water readily and, consequently, erodes easily in sloping areas.

To maintain good tilth, tillage should be kept to the minimum needed to prepare a good seedbed, to control weeds and volunteer growth, and to break up the crust that forms after a rain. Plow-plant methods that require only one or two trips across a field not only reduce soil compaction but also help to reduce weeds, conserve moisture, and control erosion. The use of tillage to break up surface crusts is not often necessary on soils that have a high organic-matter content, such as those of the Flanagan and Raub series. It is more often necessary on soils that have a low organic-matter content, such as those of the Fincastle, Russell, and Sexton series. The use of chemicals to control weeds reduces the amount of tillage needed and the number of trips across the field. The incorporation of crop residue into the surface layer helps to reduce crusting.

Soils that have a moderately fine textured or fine textured surface layer, such as those of the Drummer and Milford series, can be worked only within a narrow range of moisture content. They become cloddy if worked when too wet. Fall plowing is generally advantageous because these soils dry out slowly in spring. In winter, freezing and thawing of fall-plowed soils breaks up the large clods and facilitates preparation of the seedbed for spring planting.

Fertility needs.—Most of the soils except those of the Harpster series are naturally acid. The content of phosphorus is low to medium, and the content of potassium is medium to high. The organic-matter content is low to high. Soils that are low in organic-matter content respond especially well to nitrogen. A readily soluble form of phosphorus is more beneficial than rock phosphate.

Most soils respond well to additions of lime and fertilizer. Harpster soils are calcareous and do not need lime. Lime and fertilizer should be applied in accordance with the results of soil tests and the needs of the crop to be grown.

Drainage practices.—Excess water is a problem on many of the soils of this county (fig. 10). Many areas of the somewhat poorly drained soils, such as those of the Flanagan and Raub series, benefit from artificial drainage, especially during wet periods. Generally, random tile lines can provide adequate drainage. Many areas of poorly drained or very poorly drained soils, such as those of the Drummer and Milford series, need a complete system of artificial drainage to improve productivity. Some soils, such as those of the Drummer series, are sufficiently permeable to be drained adequately by tile, but outlets may be lacking. Other soils, such as those of the Brooklyn and Sexton series, are not sufficiently permeable to be drained adequately by tile, and shallow surface drains are necessary. Generally, a "W" type of shallow surface drain, rather than a conventional surface drain, is used in level areas of Milford soils. In some areas of level to slightly depressional soils, such a those of the Peotone and Pella series, a combination of shallow surface drains to remove excess surface water and tile lines for subsurface drainage is used. In many areas, especially those of the Drummer soils, shallow drains are used also to remove runoff from surrounding higher areas.

Outlets for tile lines and shallow surface drains are provided mainly by deep ditches in the lakebed areas. Structures to control erosion and gullying are needed at the outlet end of shallow surface drains at the point where the drains empty into open ditches.

Most areas of soils on bottom lands, such as those of the Sawmill and Wabash series, are subject to flooding. In these areas perennial or overwintering crops are subject to damage. Scouring, deposition, and the accumulation of debris also cause some damage. Small levees and diversions can provide local relief; but, generally, protection of an entire watershed is the real need.

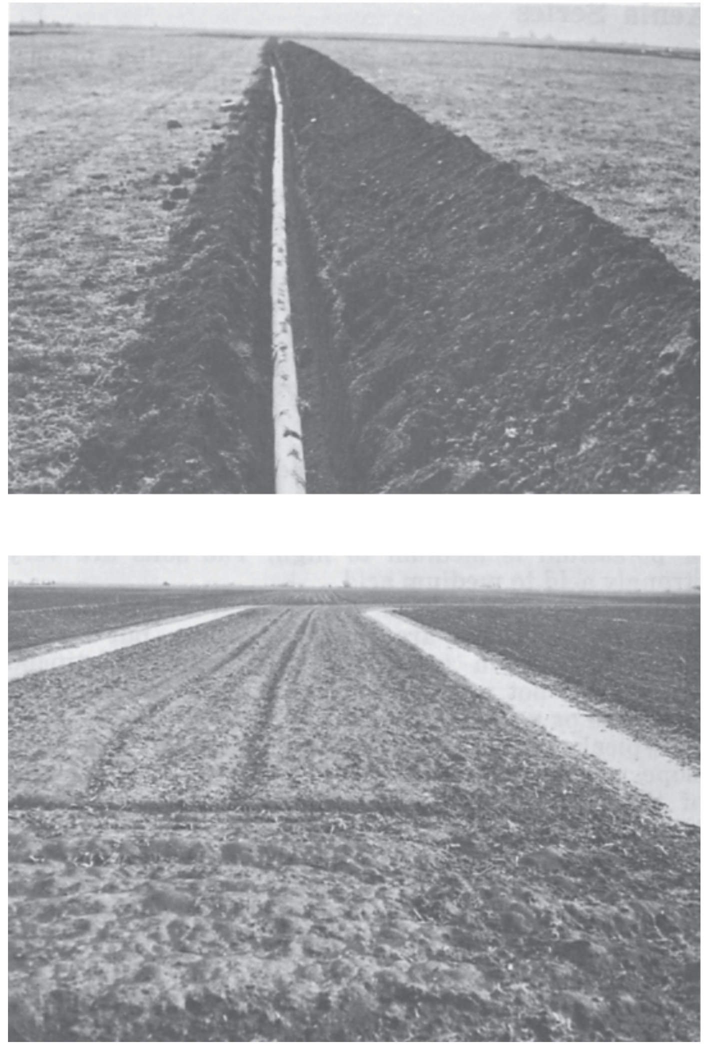


***Figure 10.*—Two methods of drainage. The upper picture shows tile installed in poorly drained Drummer soils. The lower picture shows shallow surface ditches, used to drain Milford soils.**

Erosion control.—Erosion is a hazard on the sloping soils in this county. It is a severe to very severe hazard in areas of strongly sloping to steep soils of the Camden, Miami, Nappanee, Russell, and Strawn series. The loss of any of the surface soil reduces the organic-matter content and the supply of plant nutrients. It also makes the soil less absorbent; consequently, more water runs off, the rate of erosion increases, and the supply of available moisture decreases.

Water causes both sheet and gully erosion. The rate of erosion depends on the amount and intensity of rainfall; the length and steepness of slopes; the texture, structure, and permeability of the soil; and the vegetation.

The following practices help to control erosion: (1) using a suitable cropping system; (2) terracing (fig. 11) where slopes are less than 12 percent; (3) establishing suitable grasses in waterways and out-

Figure 11.—**Terracing and contouring to control erosion. This is an area of gently sloping Dana soils.**

lets; (4) diverting water from higher areas; (5) tilling and planting on the contour; (6) minimizing tillage; (7) utilizing crop residue; and (8) installing dams, grade stabilization structures, or other structures as needed.

Soil blowing is also a hazard on some soils. In this county, only the soils of the Alvin and Ridgeville series, which have a sandy surface layer, are subject to severe soil blowing. A growing crop or crop residue should be kept on these soils at all times. Rough tillage helps to hold the soil in place. Early in spring, when the surface is dry, some soil blowing can be expected on fall-plowed soils, especially on those of the Drummer, Flanagan, and Milford series. Disking at intervals across the direction of the prevailing winds helps to check soil loss.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, the subclass, and the unit (in this soil survey called management group). These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

- Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.
- Class VII soils have very severe limitations that make them unsuited to cultivation and restrict their use largely to pasture or range, woodland, or wildlife habitat. (None in Douglas County)
- Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Douglas County)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry. The *c* and *s* subclasses are not used in Douglas County.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w, s,* and *c,* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS (management groups in this county) are soil groups within the subclasses. The soils in one management group are enough alike to be suited to the same crops and pasture plants, to require similar management, and to be similar in productivity and other responses to management. Thus, the management group is a convenient grouping for making many statements about management of soils. Management groups are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–3 or IIIe–1. Thus, in one symbol the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the management group within each subclass.

In the following pages the management groups in Douglas County are described, and suggestions for the use and management of the soils are given. The names of the soil series represented are mentioned in the description of each management group, but this does not mean that all the soils of a given series are in the group. The management classification of each soil is given in the "Guide to Mapping Units."

MANAGEMENT GROUP I–1

Camden silt loam, 0 to 2 percent slopes, is the only soil in this management group. This is a deep, well-drained, uneroded soil that has a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of potassium is medium to high, and the content of phosphorus is low. The soil is slightly acid to medium acid.

Maintaining the organic-matter content, good tilth, and fertility are slight problems in managing this soil. Returning crop residue and plowing under a green-manure catch crop about every fourth year are ways to maintain the organic-matter content and good tilth.

This soil is used mainly for cash-grain crops. It is well suited to the commonly grown crops, mainly corn, soybeans, wheat, oats, and alfalfa. It is also well suited to grasses and trees. In areas used for pasture, a mixture of legumes and grasses, such as alfalfa, birdsfoot trefoil, tall fescue, and bromegrass, is suitable for seeding. This soil is not ordinarily used for woodland.

MANAGEMENT GROUP I–2

This group consists of deep, somewhat poorly drained soils of the Brenton, Elburn, Flanagan, Millbrook, Raub, Ridgeville, Sunbury, and Toronto series. These soils are level to gently sloping and are uneroded. All except the Ridgeville soil, which is moderately coarse textured, have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate to moderately slow in all except the Ridgeville soil, which is moderately to moderately rapidly permeable. The available moisture capacity is high to very high in all except the Ridgeville soil, which has a moderate available moisture capacity. The content of potassium is medium to high, and the content of phosphorus is low to medium. The organic-matter content is medium to high. All the soils are medium acid to neutral except the Toronto soil, which is strongly acid to slightly acid.

Additional drainage is needed in some areas, and maintaining the organic-matter content, tilth, and fertility is a necessary part of good management. Droughtiness is also a slight problem on the Ridgeville soil. Erosion is a slight hazard in areas where the slope range is as much as 3 percent.

The return of all crop residue is needed to maintain the organic-matter content and tilth. A cropping system that includes a green-manure catch crop about every fourth year is helpful. A catch crop about every sixth or seventh year is generally suitable if minimum tillage is used.

Artificial drainage is needed in some areas that have a few seepy spots. Random tile lines are effective where adequate outlets are available.

These soils are used mainly for cash-grain crops. They are well suited to the commonly grown crops, chiefly corn and soybeans. Wheat, oats, and alfalfa are also suitable, but less acreage is used for them, except in the southwestern part of the county (fig. 12).

Figure 12.—**Small grains grown on soils of management group I–2. This area is in the southwestern part of the county.**

These soils are also well suited to pasture. Alsike clover, Ladino clover, birdsfoot trefoil, timothy, and reed canarygrass are among the suitable legumes and grasses to be favored when reseeding. Few areas are used as woodland.

MANAGEMENT GROUP I–3

Lawson silt loam is the only soil in this management group. This is a deep, somewhat poorly drained soil on flood plains. It is level to nearly level and is uneroded.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is high, and the content of phosphorus and potassium is high. The soil is slightly acid to neutral.

Maintaining the organic-matter content, good tilth, and fertility and providing additional drainage are necessary parts of good management. Flooding and wetness are serious problems in some areas. The return of all crop residue, along with a cropping system that includes a green-manure catch crop about every fourth year, helps to maintain the organic-matter content and good tilth. If minimum tillage is used, a green-manure catch crop every sixth or seventh year is generally suitable. Tile lines provide adequate drainage in seepy areas where outlets are available.

This soil is well suited to crops, pasture, and woodland. Most areas are used for cultivated crops, chiefly corn, soybeans, wheat, oats, and alfalfa. All the commonly grown crops are suitable. Areas that are wet or subject to flooding are used for pasture or woodland. Many of these areas are small and are not accessible with farm machinery. In the few areas used for pasture, a mixture of grasses and legumes, such as alsike clover, Ladino clover, birdsfoot trefoil, timothy, and reed canarygrass, is suitable. White ash, cottonwood, red maple, and silver maple should be favored in areas used for woodland.

MANAGEMENT GROUP IIe–1

This group consists of deep, moderately well drained and well drained soils of the Catlin, Dana, Harvard, Montmorenci, Plano, and Proctor series. These soils are gently sloping to moderately sloping and are uneroded to eroded. They have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate, and the available moisture capacity is high to very high. The organic-matter content is medium to high. The content of phosphorus is low to medium, and the content of potassium is medium to high. The soils are slightly acid to neutral.

Controlling erosion is the major management problem, but erosion can be controlled easily. A cropping system that includes about 2 years of row crops out of 4 not only controls erosion but also maintains the organic-matter content and good tilth. The return of all crop residue also helps to maintain the organic-matter content and good tilth. If conservation practices, such as terracing and contouring (fig. 13), are used, a cropping system that includes about 3 years of row crops is suitable. Grassed waterways will remove excess surface water safely.

Figure 13.—**An area of gently sloping Dana soils, cultivated on the contour. The crop is soybeans.**

These soils generally are used for cash crops, chiefly corn and soybeans. They are also well suited to oats, wheat, alfalfa, and grasses, but less acreage is used for these crops. In areas used for pasture, grasses and legumes, such as alfalfa, birdsfoot trefoil, timothy, bromegrass, and orchardgrass, should be favored when reseeding. Ordinarily, these soils are not used for woodland.

MANAGEMENT GROUP IIe-2

This group consists of deep, moderately well drained or well drained soils of the Alvin, Camden, Miami, Russell, St. Charles, and Xenia series. In this group are both gently sloping, uneroded soils and moderately sloping, eroded soils. All except the Alvin soil have a medium-textured surface layer and a moderately fine textured subsoil. The Alvin soil has a moderately coarse textured surface layer and a moderately coarse textured or moderately fine textured subsoil.

Permeability is moderate in all except the Alvin soil, which is moderately to moderately rapidly permeable. The available moisture capacity is moderate in the Alvin soil but is high in all the others. The organic-matter content is low. The content of phosphorus is low to medium, and the content of potassium is medium to high in all except the Alvin soil. The Alvin soil has a low to medium content of potassium. All except the Xenia soil are medium acid to neutral. The Xenia soil is strongly acid to slightly acid.

Controlling erosion is the main management problem. Maintaining the organic-matter content and good tilth are slight problems. The Alvin soil is droughty, and maintenance of fertility is a problem.

If conservation practices, such as terracing and contouring, are not used, a cropping system that includes grasses and legumes at least half the time can control erosion. With the use of conservation practices, grasses and legumes grown as a cover crop and plowed under as a green-manure crop 1 year in 5 will control erosion. The return of all crop residue will maintain the organic-matter content and good tilth.

On the Alvin soil, the return of crop residue helps to store moisture for crop use, and leaving the residue on the surface as much as possible reduces soil blowing. Also fertilizer should be applied frequently and in small amounts because this soil has a low capacity to store nutrients.

Most areas are used for cultivated crops. These soils, especially the gently sloping phases, are well suited to corn, soybeans, oats, and wheat. They are also well suited to grasses and legumes grown for hay or pasture. In areas used for pasture, alfalfa, birdsfoot trefoil, orchardgrass, bromegrass, and timothy are among the species to be favored when reseeding. In existing stands of trees, red oak, white oak, bur oak, white ash, black walnut, basswood, and black cherry should be favored.

MANAGEMENT GROUP IIe-3

This group consists of deep, gently sloping, somewhat poorly drained soils of the Elburn, Flanagan, Raub, Rutland, Sunbury, and Toronto series. These soils have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate to moderately slow, and the available moisture capacity is high to very high. The organic-matter content is medium to high. The content of phosphorus is low to medium, and the content of potassium is medium to high. The soils are medium acid to neutral, except the Toronto soil, which is strongly acid to slightly acid.

Controlling erosion is the major management problem. Maintaining the organic-matter content, good tilth, and fertility, and providing additional drainage in some areas, are slight management problems.

Erosion can be controlled adequately by contour farming, establishing terraces and grassed waterways (fig. 14), and using a cropping system that includes a green-manure catch crop about 1 year in 4. If conservation practices are not used, a cropping system that includes a green-manure catch crop about 1 year in 3 is needed to control erosion. The return of crop residue, combined with a conservation cropping system, will maintain the organic-matter content and tilth. Additional drainage is needed in small seepy spots in some places. Tile drains are satisfactory where outlets are available.

These soils are well suited to corn, soybeans, and small grains. If protected from erosion, they can be used intensively for cultivated crops. They are also well suited to grasses and legumes grown for hay or pasture. In areas used for pasture, a mixture of legumes and grasses should be favored. Among the suitable species are alsike clover, Ladino clover, birdsfoot trefoil, reed canarygrass, and timothy. Ordinarily, these soils are not used for woodland.

MANAGEMENT GROUP IIe-4

This group consists of deep, gently sloping, somewhat poorly drained soils of the Fincastle, Kernan, and Sabina series. These soils have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate to moderately slow, and the available moisture capacity is high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium to high. The soils are medium acid to neutral.

Controlling erosion, maintaining good tilth, and maintaining the organic-matter content are the major problems in management. Additional drainage is needed in some areas.

A cropping system that includes a green-manure catch crop about 1 year in 4 will maintain good tilth and the organic-matter content if conservation practices such as contouring and terracing are used. If these practices are not used, a cropping system that includes a green-manure catch crop about 1 year in 3 is needed to control erosion.

Figure 14.—A grassed waterway used to control erosion. This is an area of Flanagan soils.

Artificial drainage is not needed in most areas. Tile lines can provide subsurface drainage where needed.

Most areas have been cleared and are cultivated. Corn, soybeans, and small grains are suitable crops. The soils are also suited to trees and to grasses and legumes grown for hay and pasture. Alsike clover, birdsfoot trefoil, Ladino clover, timothy, and reed canarygrass should be favored when reseeding pasture. In existing stands of trees, black walnut, bur oak, red oak, white oak, white ash, and black cherry should be favored.

MANAGEMENT GROUP IIw-1

This group consists of deep, level to nearly level soils of the Fincastle, Kendall, Kernan, Rutland, Sabina, and Starks series. These soils have a medium-textured surface layer and a moderately fine textured subsoil. They are uneroded.

Permeability is moderate to moderately slow, and the available moisture capacity is high to very high. Except for the Rutland soil, which has a high organic-matter content, the organic-matter content is low.

Generally, the content of phosphorus is low, and the content of potassium is medium to high. Except for the Sabina soil, which is strongly acid to medium acid, the soils are medium acid to neutral.

Providing drainage, maintaining good tilth, and maintaining the organic-matter content are the major management problems.

Artificial drainage is needed in most areas. Shallow surface drains will remove excess surface water safely in areas where outlets are available. Tile drains are effective if good management practices are used.

A cropping system that includes a green-manure catch crop about 1 year in 4 will maintain good tilth and the organic-matter content.

Most areas are cultivated. The soils are suited to corn, soybeans, and small grains. They are also suited to trees and to grasses and legumes grown for hay and pasture. Alsike clover, birdsfoot trefoil, Ladino clover, timothy, and reed canarygrass should be favored when reseeding pasture. In existing stands of trees, black walnut, bur oak, red oak, white oak, white ash, and black cherry should be favored.

MANAGEMENT GROUP IIw-2

This group consists of deep, poorly drained and very poorly drained soils of the Drummer, Harpster, Milford, and Pella series. These soils have a moderately fine textured or medium-textured surface layer and a moderately fine textured to fine textured subsoil. Included in this management group are three spots of muck southeast of Hindsboro.

Permeability is moderate to slow, and the available moisture capacity is high to very high. The organic-matter content is high. The content of potassium is high, except in the Harpster soil, where it is medium to low. The content of phosphorus is low to medium. The soils are slightly acid to moderately alkaline. The Harpster soil is calcareous.

Providing drainage is the main requirement. Tile drainage is effective where adequate outlets are available. Tile lines should be spaced more closely in areas of Milford soils, because permeability is moderately slow in these soils. Special precautions should be used when installing tile lines in areas of muck. In some areas shallow surface drains are needed to remove water from surrounding areas. Open ditches (fig. 15) are used to provide outlets for shallow drains and tile lines.

Careful management, including the return of crop residue, is needed to maintain tilth. A cropping system that includes a green-manure catch crop about every fourth year helps to maintain tilth. If minimum tillage is used, a green-manure catch crop every sixth or seventh year is generally suitable.

It is especially important that these soils not be tilled when wet. If practical, they should be fall plowed so that large clods are broken up by freezing and thawing. Another advantage is that fall-plowed areas dry out more quickly in spring and are easier to work.

Soil blowing and fire are hazards on the areas of muck.

Most areas are used for cultivated crops. Drained areas are well suited to corn and soybeans. Wheat, oats, and alfalfa are also suitable. In areas used for pasture, alsike clover, Ladino clover, birdsfoot trefoil, timothy, and reed canarygrass should be favored when reseeding. Few areas of these soils are used as woodland.

MANAGEMENT GROUP IIw-3

This group consists of deep, level to nearly level, poorly drained soils of the Brooklyn and Sexton series. These soils have a medium-textured surface layer and a moderately fine textured subsoil. They are uneroded.

Permeability is slow, and the available moisture capacity is high. The organic-matter content of the Brooklyn soil is medium, and that of the Sexton soil is low. The internal movement of water is slow. The soils are strongly acid to slightly acid.

Providing adequate drainage and maintaining good tilth are the major management problems.

Many areas have a high water table. In a few areas surface water accumulates. Shallow surface drains remove excess surface water. Tile lines provide limited subsurface drainage in areas where outlets are available.

A cropping system that includes a green-manure crop about every fourth year and returns all crop residue helps to maintain favorable tilth.

Drained areas are suited to corn, soybeans, and small grains. They are suited also to grasses and legumes grown for hay or pasture. Alsike clover, Ladino clover, timothy, and reed canarygrass are suitable pasture plants. Few areas of the Brooklyn soil are used for woodland. In existing stands, white ash, cottonwood, silver maple, and red maple should be favored.

MANAGEMENT GROUP IIw-4

Sawmill silty clay loam is the only soil in this management group. This is a deep, level to nearly level, poorly drained to very poorly drained soil on bottom

Figure 15—A drainage ditch, about 6 feet deep, used to provide outlets for shallow surface drains and tile lines. This is an area of Milford soils.

lands. It has a moderately fine textured surface layer and subsoil.

Permeability is moderate, and the available moisture capacity is very high. The organic-matter content is very high. The content of phosphorus is medium, and the content of potassium is medium to high. The soil is slightly acid to neutral.

Providing adequate drainage and maintaining good tilth are the major management problems. The soil is flooded occasionally early in spring.

A cropping system that includes a green-manure catch crop about every fourth or fifth year and returns all crop residue helps to maintain good tilth. Tile provides adequate subsurface drainage in areas where good management is used and where outlets are available. Shallow surface drains remove excess surface water. If practical, the soil should be fall plowed so that large clods are broken up by freezing and thawing, and the preparation of the seedbed for spring planting is easier. Another advantage is that fall-plowed soils dry out more quickly in spring.

This soil is suited to corn, soybeans, and small grain. It is also suited to grasses and legumes grown for hay or pasture. Alsike clover, Ladino clover, birdsfoot trefoil, timothy, and reed canarygrass should be favored when reseeding pasture. In existing woodland, ash, sycamore, cottonwood, swamp white oak, and pin oak should be favored.

MANAGEMENT GROUP IIIe-1

This group consists of deep, moderately well drained and well drained soils of the Camden, Miami, and Russell series. These soils are moderately sloping to strongly sloping and are eroded to severely eroded. They have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate, and the available moisture capacity is high. The organic-matter content is low. The content of potassium is medium to high, and the content of phosphorus is low to medium. Generally, the soils are medium acid to neutral, but in some places they are strongly acid.

Controlling erosion is the main management problem. Maintaining the organic-matter content is a slight problem. Maintaining good tilth is a serious problem in areas of severely eroded soils.

If conservation practices, such as contouring and terracing, are not used, a cropping system that includes legumes and grasses about 3 years out of 5 is needed to control erosion. If these soils are terraced and contoured, a cropping system that includes legumes and grasses about every fourth year will control erosion. These cropping systems also help to maintain good tilth and the organic-matter content. Frequent applications of nitrogen are needed, especially on the severely eroded soils.

Most areas have been cleared. If the soils are used for pasture (fig. 16) a mixture of legumes and grasses, such as alfalfa, birdsfoot trefoil, red clover, bromegrass, and orchardgrass, is suitable. In existing stands of trees, red oak, white oak, bur oak, white ash, black walnut, basswood, and black cherry should be favored.

MANAGEMENT GROUP IIIw-1

Peotone silty clay loam is the only soil in this management group. This is a deep, very poorly drained soil in nearly level to depressional areas. It has a moderately fine textured surface layer and a moderately fine textured subsoil.

Figure 16.—Permanent pasture on Russell soils.

Permeability is moderately slow, and the available moisture capacity is high to very high. The organic-matter content is very high. The content of phosphorus is low to medium, and the content of potassium is high. The soil is medium acid to slightly acid.

Providing adequate drainage and maintaining good tilth are the major management problems. A cropping system that includes a green-manure catch crop every fourth or fifth year and returns all crop residue helps to maintain good tilth. Because this soil commonly occurs in depressions, it receives runoff from surrounding areas, and in many places outlets are difficult to locate. Shallow surface drains or surface inlets to tile lines should be used to remove excess surface water. Tile drains are effective for subsurface drainage where good management is used and where outlets are available. If practical, the soil should be fall plowed, so that large clods are broken up by freezing and thawing and preparation of the seedbed for spring planting is made easier. Another advantage is that fall-plowed soil dries out more quickly in spring.

Drained areas are suited to corn and soybeans. They are also suited to grasses and legumes for hay or pasture. Alsike clover, Ladino clover, birdsfoot trefoil, timothy, and reed canarygrass should be favored when reseeding pasture.

MANAGEMENT GROUP IVe–1

This group consists of deep, moderately well drained and well drained soils of the Camden, Miami, and Strawn series. These soils are strongly sloping to moderately steep and are severely eroded to eroded. They have a medium-textured surface layer and a moderately fine textured subsoil.

Permeability is moderate in the subsoil. Soils of the Miami and Strawn series are moderately to moderately slowly permeable below the subsoil. Except for the Strawn soil, the available moisture capacity is high. It is moderate to high in the Strawn soil. The organic-matter content is low. The content of potassium is medium to high, and the content of phosphorus is low to medium. The soils are medium acid to neutral.

Controlling erosion and maintaining good tilth are the main management problems. Maintaining the organic-matter content and adequate fertility is a slight problem.

Terraces, contour strips, and grassed waterways are needed to control erosion if an occasional row crop is grown. If these conservation practices are not used, a cropping system that includes only small grains and grasses and legumes is needed to control erosion and to maintain the organic-matter content and good tilth. In reseeding pasture, plowing or disking should be thorough enough to kill existing sod, sprouts, and brush. Contouring helps to check erosion. Grazing should be regulated in established pastures, and clipping is needed to control weeds and brush. Wooded areas should be protected from fire, and grazing animals should be excluded. Erosion control practices are needed in harvesting timber and building logging trails.

These soils can be used to a limited extent for corn, soybeans, wheat, oats, and alfalfa. They are well suited to trees and grasses. Alfalfa, birdsfoot trefoil, bromegrass, timothy, and orchardgrass are suitable pasture plants. In existing stands of trees, red oak, white oak, bur oak, white ash, black walnut, basswood, and black cherry should be favored.

MANAGEMENT GROUP Vw–1

This group consists of deep, poorly drained to very poorly drained soils of the Sawmill and Wabash series. These soils are moderately fine textured to fine textured. They are on bottom lands and are wet for long periods.

Permeability is moderate to slow, and the available moisture capacity is high to very high. The organic-matter content is high to very high. The content of potassium and phosphorus is medium to high. The soils are slightly acid to neutral.

These soils are wet or are frequently flooded during the growing season. Providing drainage and preventing flooding are the major management problems. Pasture and woodland are suitable uses. In areas used for pasture, timothy, reed canarygrass, Ladino clover, alsike clover, and birdsfoot trefoil should be favored when reseeding. Grazing should be regulated, and clipping is needed to control weeds and brush. The soils should not be grazed when wet. In existing stands of trees, white ash, cottonwood, red maple, silver maple, and swamp white oak should be favored.

MANAGEMENT GROUP VIe–1

This group consists of deep, strongly sloping to steep soils of the Nappanee and Strawn series. The Strawn soil is well drained and has a medium-textured surface layer and a moderately fine textured subsoil. Nappanee soils are somewhat poorly drained and have a moderately fine textured surface layer and a moderately fine textured or fine textured subsoil.

The Strawn soil is moderately permeable in the subsoil and moderately to moderately slowly permeable below the subsoil. Nappanee soils are slowly permeable or very slowly permeable. The available moisture capacity is moderate to high. The organic-matter content is low. The content of phosphorus is low, and the content of potassium is medium. The soils are slightly acid to mildly alkaline.

Controlling erosion and maintaining good tilth are major management problems in both soils. The slow internal movement of water is a major problem in Nappanee soils. In areas of pasture, old sod should be torn up by plowing or disking when reseeding. To control erosion, these operations should be performed on the contour where possible. To control erosion in areas of woodland, care is needed in harvesting and in building logging trails. These areas should be protected from fire and grazing.

These soils are suited to permanent vegetation, such as pasture or woodland. In areas used for pasture, alfalfa, birdsfoot trefoil, bromegrass, timothy, and orchardgrass should be favored when reseeding. In existing stands of trees, red oak, white oak, bur oak, white ash, black walnut, basswood, and black cherry should be favored in harvesting or reseeding. Black locust, white pine, red pine, and cottonwood are also suitable for use when reseeding.

Predicted yields

Table 3 gives predicted average yields per acre of the principal crops grown in Douglas County. In columns A are yields to be expected under an average level of management. In columns B are yields to be expected under a high level of management.

An average (A) level of management includes all elements normally considered to be a part of good management, but one or more of these elements is not adequately handled. Plant nutrients may be out of balance; loss of soil and water may be only partly controlled; drainage may need to be supplemented; or cropping systems may need to be altered. Other items that may apply are the lack of proper timing for tillage, inadequate plant populations for optimum yields, and unseasonable or inadequate use of insecticides and herbicides.

A high (B) level of management consists of adequate surface or internal drainage and protection from flooding where needed; adequate erosion control; use of high-quality seed; and control of weeds, diseases, and harmful insects. Soil reaction, phosphorus, and potash are kept at optimum levels, based on soil tests and previous experience. Optimum soil structure is maintained by proper tillage methods and by cultivating when soil and moisture conditions are favorable. The supply of nitrogen in the soil is supplemented with nitrogen fertilizer as needed. Organic matter is returned to the soil in the form of crop residue, barnyard manure, and green-manure catch crops. Crops are harvested with a minimum of loss. High-level management, however, does not include irrigation.

Predictions of yields under a high (B) level of management were made for both a long term, which includes some years of less than optimum weather, and a short term, based on especially favorable weather conditions. Yield predictions in the second "B" column do not reflect the very top yields that can be obtained in a single year by using very heavy fertilization, but rather the predicted average yields when fertilization is consistent with a high level of management and weather conditions are especially favorable.

Use of the Soils for Woodland[6]

At the time Douglas County was settled, forest covered about 36,500 acres, or 14 percent of the acreage. Most of the timber was along the Embarras and Kaskaskia Rivers and their major tributaries. Good stands of mixed oak, hickory, maple, elm, and some other species of hardwoods grew on the uplands. Sycamore, cottonwood, willow, and mixed hardwoods grew on the bottom lands. Areas away from the streams did not support trees.

As the number of settlers increased, more and more timber was cleared to make way for farmland. At the present time about 2,500 acres, or 1.3 percent of the county, is wooded. Nearly all the wooded areas (fig. 17) are used for pasture. They are not suitable for farming, because they are steep, inaccessible, or wet, or because they have other limitations that affect their use for crops.

There is a fair market in this county for woodland products. White oak for barrel staves is in demand, and hardwood saw logs are used for lumber for local use.

Most of the woodlands receive little management, and many of the trees are of poor quality or are species that have limited commercial value. Good management is needed on existing stands to make them of profitable quality. Excluding grazing livestock and protecting the woodland from fire will improve the ground cover for erosion control and will allow young seedlings to grow and replace harvested trees. Harvesting cull trees will encourage the growth of desirable species.

The species to be favored when thinning or harvesting trees on deep, well-drained soils, such as those of the Camden and St. Charles series, are yellow-poplar, black walnut, white oak, red oak, bur oak, hackberry, sugar maple, sweetgum, yellow-poplar, white oak, red oak, ash, white pine, red pine, and Scotch pine. Scotch pine is generally suitable only for Christmas trees. The production potential for upland oaks is more than 350 board feet per acre per year; that of yellow-poplar is 275 to 550 board feet per acre per year.

The species to be favored when thinning or harvesting trees on well-drained soils, such as those of the Miami, Russell, and Strawn series, are white oak, red oak, black oak, white ash, hackberry, bur oak, and hard maple. Among the hardwoods suitable for use when replanting are white oak, red oak, ash, yellow-poplar, and black walnut. Trees suitable for planting are red pine, white pine, and Scotch pine.

Figure 17.—**Timber on a moderately steep area of Strawn soils. These soils are dissected by drainage channels.**

[6] CLARK RINKER, forester, Soil Conservation Service, Champaign, and WILLIAM R. BOGGESS, professor of forestry, University of Illinois, Urbana, assisted in the preparation of this section.

TABLE 3.—*Predicted average yields per acre of principal crops*

[Yield predictions in columns A are those to be expected under an average level of management over a 5- to 10-year period; those in columns B are to be expected under a high level of management over a like period. An additional column B indicates yields that can be expected under a high level of management in years when weather conditions are especially favorable. Absence of a yield figure indicates that the crop is not well suited to the soil or that it is not commonly grown]

Soil	Corn			Soybeans			Wheat			Hay and pasture			Rotation pasture		
	Long-term average yields		Yields in favorable years	Long-term average yields		Yields in favorable years	Long-term average yields		Yields in favorable years	Long-term average yields		Yields in favorable years	Long-term average yields		Yields in favorable years
	A	B	B	A	B	B	A	B	B	A	B	B	A	B	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Animal-unit-days* [1]	*Animal-unit-days* [1]	*Animal-unit-days* [1]
Alvin fine sandy loam, 2 to 4 percent slopes	70	85	105	22	28	35	28	34	43	2.8	3.4	4.3	140	195	245
Brenton silt loam	110	140	175	36	44	55	44	54	68	4.4	5.4	6.8	220	320	400
Brooklyn silt loam	80	100	130	28	36	45	32	40	50	3.2	4.0	5.0	170	230	300
Camden silt loam, 0 to 2 percent slopes	85	105	130	26	34	43	34	42	53	3.4	4.2	5.3	170	240	300
Camden silt loam, 2 to 4 percent slopes	85	105	130	26	34	43	34	42	53	3.4	4.2	5.3	170	240	300
Camden silt loam, 4 to 7 percent slopes, eroded	70	90	115	24	30	38	28	36	45	2.8	3.6	4.5	140	205	260
Camden silt loam, 7 to 12 percent slopes, eroded	70	85	105	22	28	35	28	34	43	2.8	3.4	4.3	140	195	245
Camden soils, 7 to 25 percent slopes, severely eroded	--	--	---	--	--	--	--	--	--	2.2	2.8	3.5	110	160	200
Catlin silt loam, 2 to 4 percent slopes	110	135	170	36	44	55	42	52	65	4.4	5.4	6.8	220	310	385
Dana silt loam, 2 to 4 percent slopes	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Drummer silt loam, overwash	105	130	165	34	42	53	42	52	65	4.2	5.2	6.5	210	295	370
Drummer silty clay loam	105	130	165	34	42	53	42	52	65	4.2	5.2	6.5	210	295	370
Elburn silt loam, 0 to 2 percent slopes	110	140	175	36	44	55	44	54	68	4.4	5.6	7.0	220	320	400
Elburn silt loam, 2 to 4 percent slopes	110	140	175	36	44	55	44	54	68	4.4	5.6	7.0	220	320	400
Fincastle silt loam, 0 to 2 percent slopes	90	110	140	28	36	45	36	44	55	3.6	4.4	5.5	180	250	315
Fincastle silt loam, 2 to 4 percent slopes	90	110	140	28	36	45	36	44	55	3.6	4.4	5.5	180	250	315
Flanagan silt loam, 0 to 2 percent slopes	110	140	175	36	44	55	44	54	68	4.4	5.6	7.0	220	320	400
Flanagan silt loam, 2 to 4 percent slopes	110	140	175	36	44	55	44	54	68	4.4	5.6	7.0	220	320	400
Harpster silty clay loam	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Harvard silt loam, 1 to 4 percent slopes	90	115	145	30	38	48	38	46	58	3.8	4.6	5.8	190	265	330
Harvard silt loam, 4 to 7 percent slopes, eroded	80	110	140	26	34	43	32	40	50	3.4	4.0	5.0	170	230	285
Kendall silt loam	90	115	145	30	38	48	36	46	58	3.6	4.6	5.8	180	265	330
Kernan silt loam, 0 to 2 percent slopes	80	110	140	26	34	43	32	40	50	3.4	4.0	5.0	170	230	290
Kernan silt loam, 2 to 4 percent slopes	90	115	145	30	38	48	36	46	58	3.6	4.6	5.8	180	265	330
Lawson silt loam	110	135	170	36	44	55	42	52	65	4.4	5.4	6.8	215	310	385
Miami silt loam, 4 to 7 percent slopes, eroded	70	85	105	24	30	38	28	32	43	2.8	3.4	4.3	140	195	245
Miami silt loam, 7 to 12 percent slopes, eroded	65	80	100	22	28	35	26	32	40	2.6	3.2	4.0	130	185	230

Miami soils, 4 to 7 percent slopes, severely eroded	60	75	95	20	26	33	24	30	38	2.4	3.0	3.8	120	170	215
Miami soils, 7 to 12 percent slopes, severely eroded	--	--	---	--	--	--	--	--	--	2.2	2.8	3.5	110	160	200
Milford silty clay loam	90	110	140	30	38	48	36	44	55	3.6	4.4	5.5	180	250	315
Millbrook silt loam	90	115	145	30	38	48	38	46	58	3.8	4.6	5.8	190	265	330
Montmorenci silt loam, 4 to 7 percent slopes, eroded	70	90	115	24	30	38	28	36	45	2.8	3.6	4.5	140	205	260
Nappanee soils, 5 to 12 percent slopes, severely eroded	--	--	---	--	--	--	12	16	20	1.2	1.6	2.0	60	90	115
Pella silty clay loam	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Peotone silty clay loam	80	100	130	28	36	45	32	40	50	3.2	4.0	5.0	170	230	300
Plano silt loam, 1 to 4 percent slopes	110	135	170	36	44	55	42	52	65	4.4	5.4	6.8	220	310	385
Proctor silt loam, 1 to 4 percent slopes	100	125	155	34	42	53	40	50	63	4.0	5.0	6.3	200	285	360
Raub silt loam, 0 to 2 percent slopes	110	135	170	36	44	55	42	52	65	4.4	5.4	6.8	220	310	385
Raub silt loam, 2 to 4 percent slopes	110	135	170	36	44	55	42	52	65	4.4	5.4	6.8	220	310	385
Ridgeville fine sandy loam	75	100	125	28	36	45	32	40	50	3.2	4.0	5.0	160	225	285
Russell silt loam, 4 to 7 percent slopes, eroded	70	90	115	24	30	38	28	36	45	2.8	3.6	4.5	140	205	260
Russell silt loam, 7 to 12 percent slopes, eroded	70	85	105	22	28	35	28	34	43	2.8	3.4	4.3	140	195	245
Russell soils, 4 to 7 percent slopes, severely eroded	60	75	95	20	26	33	24	30	38	2.4	3.0	3.8	120	170	215
Rutland silt loam, 0 to 2 percent slopes	105	130	165	34	42	55	42	52	65	4.2	5.2	6.5	210	300	380
Rutland silt loam, 2 to 4 percent slopes	105	130	165	34	42	55	42	52	65	4.2	5.2	6.5	210	300	380
Sabina silt loam, 0 to 2 percent slopes	90	115	145	30	38	48	36	46	58	3.6	4.6	5.8	180	265	330
Sabina silt loam, 2 to 4 percent slopes	90	115	145	30	38	48	36	46	58	3.6	4.6	5.8	180	265	330
St. Charles silt loam, 1 to 4 percent slopes	90	115	145	30	38	48	38	46	58	3.8	4.6	5.8	185	265	330
Sawmill silty clay loam	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Sawmill silty clay loam, wet	--	---	---	--	---	---	--	--	--	--	--	---	140	---	---
Sexton silt loam	75	95	120	26	32	40	32	38	48	3.2	4.0	5.0	155	215	275
Starks silt loam	90	110	140	30	36	45	36	44	55	3.6	4.4	5.5	175	250	315
Strawn silt loam, 12 to 18 percent slopes, eroded	55	70	90	18	22	28	22	28	35	2.2	2.8	3.5	110	160	200
Strawn silt loam, 18 to 40 percent slopes, eroded	--	---	---	--	--	--	--	--	--	1.8	2.2	2.8	90	130	160
Sunbury silt loam, 0 to 2 percent slopes	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Sunbury silt loam, 2 to 4 percent slopes	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Toronto silt loam, 0 to 2 percent slopes	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Toronto silt loam, 2 to 4 percent slopes	95	120	150	32	40	50	38	48	60	3.8	4.8	6.0	190	275	345
Wabash silty clay, wet	--	---	---	--	---	--	--	--	--	---	---	---	140	---	---
Xenia silt loam, 2 to 4 percent slopes	90	110	140	28	36	45	36	44	55	3.6	4.4	5.5	180	250	315

[1] Animal-unit-days is a term used to express the carrying capacity of pasture. It is the number of days 1 acre will carry one animal unit, such as one cow, two yearling cattle, one horse, five sheep, or four brood sows. The estimates are calculated on the basis that 2.5 tons of mixed hay equals 125 animal-unit-days.

Scotch pine is generally suitable only for Christmas trees. The production potential for upland oaks on soils of the Russell series is 300 to 400 board feet per acre per year. The production potential on soils of the Miami and Strawn series is about 250 to 350 board feet per acre per year.

The species to be favored when thinning or harvesting trees on the somewhat poorly drained soils, such as those of the Fincastle, Sabina, Sunbury, and Toronto series, are white oak, red oak, bur oak, black oak, hard maple, ash, and basswood. Trees suitable for planting are white oak, red oak, ash, white pine, red pine, and Scotch pine. Scotch pine is generally suitable only for Christmas trees. The production potential for upland oaks is about 300 to 400 board feet per acre per year.

Among the species to be favored when thinning or harvesting trees on bottom-land soils, such as those of the Lawson, Sawmill, and Wabash series, are pin oak, cherrybark oak, red oak, swamp white oak, cottonwood, bur oak, soft maple, basswood, ash, and hackberry. Trees suitable for planting are pin oak, cottonwood, sycamore, and soft maple. The production potential ranges from 350 to 750 board feet per acre per year for cottonwood and sycamore to 400 to 600 board feet for bottom-land oaks.

Use of the Soils for Wildlife[7]

The principal species of game animal in Douglas County is the ring-necked pheasant. Other species of wildlife are cottontail rabbits, gray squirrels, fox squirrels, bobwhite quail, red foxes, white-tailed deer, raccoons, opossums, skunks, muskrats, and nongame birds.

Ring-necked pheasants are abundant throughout most of the county, except in the rougher terrain of the Russell-Camden-Sawmill association. See the general soil map.

Cottontail rabbits are common, especially in the Sabina-Drummer, the Starks-Camden, and the Russell-Camden-Sawmill associations. These associations have brushy areas and fence rows that provide cover. Cover is very limited in the other associations.

Squirrels are numerous in the Russell-Camden-Sawmill association. They are less numerous in the Sabina-Drummer and the Starks-Camden associations. In the other associations there are only a few squirrels, most of them around farmsteads where there are trees.

Red foxes are sighted occasionally throughout the county, usually near streams or open ditches. They commonly use groundhog holes for dens.

A few white-tailed deer find habitat in the county, mainly in the Russell-Camden-Sawmill association. Deer from other, more heavily timbered counties seem to be extending their range along stream courses, and the deer population of Douglas County is growing.

Raccoons, opossums, skunks, and muskrats are common where water and trees provide habitat. They are most numerous in the Russell-Camden-Sawmill association, but there are only a few in the intensively farmed Drummer-Flanagan and Milford-Drummer-Flanagan associations.

Songbirds and other nongame birds are common in the county, but they are not evenly distributed. They find habitat mainly in fence rows, brushy areas, timbered areas, and uncultivated grassy areas. They are most numerous in the Russell-Camden-Sawmill association and least numerous in the Drummer-Flanagan and the Milford-Drummer-Flanagan associations.

Bass, bluegill, sunfish, crappies, bullheads, channel catfish, suckers, and carp are found in the Embarras and Kaskaskia Rivers. These streams, along with farm ponds, constitute the major fishing waters of the county. Most farm ponds have been stocked with largemouth bass and bluegills.

Use of the Soils for Recreation[8]

The demand for land and facilities for boating, swimming, picnicking, fishing, golfing, hiking, and camping is increasing in Douglas County. Suitability of the soil associations of the county for developing recreational areas varies widely. See the general soil map.

The Drummer-Flanagan and the Milford-Drummer-Flanagan soil associations have little variation in topography, and the soils are mostly poorly drained. Their potential for development of facilities for hunting and water sports is generally poor.

The Raub-Dana-Flanagan association is nearly level to moderately sloping. The potential for development of sites suitable for picnicking, golfing, and camping is fair to good. Development of locations for small ponds for swimming and fishing is limited by topography.

The Sabina-Drummer and the Starks-Camden associations are nearly level to moderately sloping. Their potential for sites suitable for picnicking, golfing, and camping is fair to good.

The Russell-Camden-Sawmill association, although small in size, has the best potential for development of recreational areas. The relief is more varied than in the other associations. This association has sloping areas that overlook nearly level bottom lands, and it supports most of the timber in the county. It also has sites suitable for ponds or lakes and good sites for picnicking, hiking, and camping facilities.

All the associations can support good stands of vegetation. Additional information about the use of specific locations for recreation can be obtained through the local office of the Soil Conservation Service.

Use of the Soils in Engineering[9]

Some soil properties are of special interest to engineers because they affect the construction and main-

[7] REX HAMILTON, biologist, U.S. Soil Conservation Service, Champaign, assisted in the preparation of this section.

[8] CLARK RINKER, forester, Soil Conservation Service, Champaign, assisted in the preparation of this section.

[9] ROBERT L. SMITH, area engineer, Soil Conservation Service, Effingham, assisted in the preparation of this section.

tenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to engineers are permeability, shear strength, compaction characteristics, drainage, shrink-swell characteristics, grain size, plasticity, and pH value. Also important is the depth to the water table and to bedrock. Soil development related to topographic position may be significant.

Much of the information in this section is presented in tables. Only the data in table 4 are from actual laboratory tests. Estimates of soil properties significant in engineering are given in table 5, and interpretations relating to engineering uses are given in table 6. At many construction sites, major variations in soil characteristics occur within the depth of the proposed excavation, and several kinds of soil occur within short distances. Specific laboratory data on engineering properties of the soil at the site should be obtained before planning detailed engineering work. Information in this report can be used in—

1. Making studies that will aid in planning and developing sites for agricultural, industrial, business, residential, and recreational purposes.
2. Making preliminary estimates of the engineering properties of the soils that are significant in planning flood control systems, diversions, terraces, and waterways.
3. Making preliminary evaluations of soils and sites that will aid in selecting locations for highways and airports and in planning detailed investigations at the selected locations.
4. Locating probable sources of road and highway construction materials.
5. Correlating performance of engineering structures with soil mapping units and developing information that will be useful in designing and maintaining such structures.
6. Determining the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplementing information obtained from other published maps, reports, and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used in this publication have a special meaning to soil scientists and a different special meaning to engineers. The Glossary defines many such terms as they are used in soil science.

Engineering classification systems

Two systems of classifying soils for engineering purposes are in general use. Classification of the soils of Douglas County according to both of these systems is given in this survey. Additional information is given in the PCA Soil Primer (*11*).

The Unified system of soil classification was developed by the Waterways Experiment Station, Corps of Engineers (*18*). In this system, soil classification is based on identification of soils according to texture and plasticity and their performance as construction material. In the Unified system SW and SP are clean sands; SM and SC are sands with fines of silt and clay, ML and CL are silts and clays with low liquid limit, and MH and CH are silts and clays with high liquid limit.

The system used by the American Association of State Highways Officials (AASHO)(*1*) is based on field performance of soils in highways. In this system, soil materials are classified into seven principal groups, designated A–1 through A–7. The best materials for use in highway subgrades (gravelly soils of high bearing capacity) are classified A–1, and the poorest (clayey soils having low strength when wet) are classified A–7.

The U.S. Department of Agriculture system of classifying soils according to texture is primarily for agricultural use, but the textural classification is useful in engineering also. In this system, soils are classified according to the proportional amount of different sizes of mineral particles. A soil that is at least 40 percent clay particles, for example, is called clay.

Test data

Table 4 gives data developed from sampling one soil series of the county. Selected layers of the soil were sampled, and the samples were tested by standard procedures, in the laboratories of the Illinois Division of Highways, Bureau of Materials, at Springfield.

The data given in table 4 were obtained by mechanical analysis and by tests made to determine the liquid limit and plastic limit of the soil material.

Tests for liquid limit and plastic limit measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil is increased from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic state to a liquid state. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 4 also gives data on the relationship between the moisture content and the density of the soil when compacted, as determined by the standard methods described in AASHO Designation: T 99–57 (*1*). If

TABLE 4.—*Engineering*

[Tests performed by Illinois Division of

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density [1]		AASHO textural classification			
				Maximum dry density	Optimum moisture	AASHO soil type	Sand	Silt	Clay (0.005 mm.)
			Inches	*Lb. per cu. ft.*	*Percent*				
Milford silty clay loam: NW¼ sec. 26, T. 15 N., R. 9 E., approximately 354 feet east of northwest section corner (center of Illinois Route 130) and 47 feet south of center of road. (Modal)	Loess and lakebed sediments	64-14431	7-15	101	18	Clay	14	40	46
		64-14432	23-30	105	19	Clay	11	33	56
		64-14433	43-52	113	16	Clay	18	36	46

[1] Based on AASHO Designation T 99-57 (*1*).

[2] Analysis according to AASHO Designation: T 88. Results by this procedure frequently differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soil. In samples from the same site, the content of clay particles smaller than 0.002 millimeter is 5 to 18 percent greater by hydrometer analyses shown in table 4 than by pipette analyses shown in table 8.

TABLE 5.—*Estimated engineering*

[The depth at which bedrock occurs is not given, because in this county bed-

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Alvin: 131B	3-6	0-8	Fine sandy loam	SM or ML	A-2 or A-4
		8-38	Sandy clay loam and sandy loam	SC or SM	A-2, A-4, or A-6
		38-60	Loamy sand and sand	SM or SP	A-2 or A-3
Brenton: 149	1-3	0-12	Silt loam	ML, CL, or OL	A-6 or A-7
		12-48	Silty clay loam and clay loam	CL	A-6 or A-7
		48-60	Stratified loam, silt loam, and sandy loam.	SC, CL, or SM	A-2, A-4, or A-6
Brooklyn: 136	0-2	0-17	Silt loam	CL	A-6 or A-7
		17-51	Clay loam, silty clay loam, and silty clay.	CL or CH	A-7
		51-60	Gravelly sandy loam and sandy clay loam.	SM or SC	A-2, A-4, or A-6
Camden: 134A, 134B, 134C2, 134D2, 134D3.	3-6	0-11	Silt loam	CL	A-4 or A-6
		11-48	Silty clay loam, clay loam, and sandy clay loam.	CL	A-6 or A-7
		48-60	Stratified loam, silt loam, and sandy loam.	SC, CL, or SM	A-2, A-4, or A-6
Catlin: 171B	2-6	0-12	Silt loam	ML, CL, or OL	A-6 or A-7
		12-52	Silty clay loam	CL	A-6 or A-7
		52-60	Silt loam or loam	ML or CL	A-4 or A-6
Dana: 56B	2-4	0-11	Silt loam	CL	A-6
		11-49	Silty clay loam and clay loam	CL	A-6 or A-7
		49-60	Loam	ML or CL	A-4 or A-6
Drummer: 152+, 152	0-2	0-14	Silty clay loam	CL, CH, or OH	A-7
		14-45	Silty clay loam	CL or CH	A-6 or A-7
		45-60	Sandy loam to silty clay loam	CL, ML, SC, or SM	A-2, A-4, or A-6

test data

Highways, Bureau of Materials, Springfield]

Mechanical analysis [2]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—				Percentage smaller than—							
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [3]	Unified [4]
								Percent			
100	98	96	86	79	62	46	43	43	22	A-7-6(13)	CL
100	99	96	89	86	73	56	54	45	23	A-7-6(14)	CL
100	95	90	82	75	61	46	42	34	15	A-6(10)	CL

[3] Based on AASHO Designation M 145-49.
[4] Based on the Unified Soil Classification System (*18*).

properties of the soils

rock is so far below the surface that it presents no problem in engineering]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	100	30-60	2.0-6.3	0.13-0.17	6.1-7.3	Low	([1])	([1]).
100	100	30-50	0.63-6.3	0.14-0.18	5.6-6.5	Moderate to low	Low	Moderate.
100	95-100	0-20	6.3-20.0	0.02-0.04	5.6-6.5	Low	Low	Moderate.
100	95-100	80-95	0.63-2.0	0.20-0.25	5.6-6.5	Low	([1])	([1]).
95-100	90-100	60-90	0.63-2.0	0.18-0.21	5.6-6.5	Moderate	High	Moderate.
90-100	80-95	30-80	0.63-2.0	0.16-0.18	6.6-7.8	Low	High	Low.
100	100	80-100	0.2-0.63	0.20-0.25	5.1-6.5	Moderate	([1])	([1]).
100	100	85-100	0.06-0.20	0.15-0.18	5.1-6.5	High	High	Moderate.
90-100	80-100	30-50	0.63-2.0	0.12-0.16	6.6-7.8	Low to moderate	High	Low.
100	95-100	80-95	0.63-2.0	0.20-0.25	6.1-7.3	Low to moderate	([1])	([1]).
95-100	90-100	60-90	0.63-2.0	0.16-0.19	5.6-6.5	Moderate	Moderate	Moderate.
90-100	80-95	30-80	0.63-6.3	0.12-0.16	6.6-7.8	Low	Low	Low.
100	100	95-100	0.63-2.0	0.20-0.25	6.1-7.3	Low	([1])	([1]).
100	95-100	95-100	0.63-2.0	0.19-0.21	5.6-6.5	Moderate	Moderate	Moderate.
95-100	85-95	55-75	0.2-2.0	0.16-0.20	7.4-8.4	Low to moderate	Moderate	Low.
100	100	95-100	0.63-2.0	0.20-0.25	6.1-7.3	Low	([1])	([1]).
100	95-100	60-90	0.63-2.0	0.16-0.19	5.1-6.5	Moderate	Moderate	Moderate.
95-100	85-95	55-85	0.2-2.0	0.14-0.18	7.4-8.4	Low to moderate	Moderate	Low.
95-100	95-100	85-100	0.63-2.0	0.21-0.23	6.1-7.3	High	([1])	([1]).
95-100	95-100	85-100	0.63-2.0	0.19-0.21	6.6-7.8	Moderate to high	High	Low.
90-100	80-100	30-75	0.63-2.0	0.19-0.21	7.4-8.4	Moderate	High	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Elburn: 198A, 198B	1–3	0–17	Silt loam	CL	A–6
		17–42	Silty clay loam	CL	A–6 or A–7
		42–60	Sandy loam, loam, and silt loam	ML or SM	A–2, A–4, or A–6
Fincastle: 496A, 496B	1–3	0–12	Silt loam	ML or CL	A–4 or A–6
		12–46	Silty clay loam and clay loam	CL	A–6
		46–60	Loam	ML or CL	A–4 or A–6
Flanagan: 154A, 154B	1–3	0–13	Silt loam	ML, CL, or OL	A–6 or A–7
		13–47	Silty clay loam	CL	A–6 or A–7
		47–60	Loam or silty clay loam	CL	A–6 or A–4
Harpster: 67	0–2	0–19	Silty clay loam	CL, CH, or OH	A–7
		19–45	Silty clay loam	CL or CH	A–7 or A–6
		45–60	Sandy loam, loam, silt loam, or silty clay loam.	ML, CL, SM or SC	A–2, A–4, or A–6
Harvard: 344B, 344C2	3–6	0–13	Silt loam	CL	A–6 or A–7
		13–37	Silty clay loam and clay loam	CL	A–6 or A–7
		37–60	Stratified sandy loam, loam, and silt loam.	SC, CL, or SM	A–2, A–4, or A–6
Kendall: 242	1–3	0–11	Silt loam	CL	A–6
		11–51	Silty clay loam	CL	A–6 or A–7
		51–60	Loam, silt loam, and sandy loam	ML, CL, or SM	A–2, A–4, or A–6
Kernan: 554A, 554B	1–3	0–12	Silt loam	ML or CL	A–6
		12–42	Silty clay loam	CL	A–6 or A–7
		42–60	Silty clay and clay	CH	A–7
Lawson: 451	1–3	0–33	Silt loam	ML, CL, or OL	A–6 or A–7
		33–60	Stratified silt loam and loam	ML or CL	A–6 or A–4
Miami: 27C2, 27C3, 27D2, 27D3.	3–6	0–6	Silt loam or loam	CL or ML	A–6 or A–4
		6–38	Silty clay loam and clay loam	CL	A–6 or A–7
		38–60	Loam	CL or ML	A–6 or A–4
Milford: 69	0–2	0–19	Silty clay loam or silty clay	CL	A–7–6
		19–43	Heavy silty clay loam and silty clay.	CL or CH	A–7–6
		43–60	Silty clay loam and silty clay	CL	A–6 or A–7–6
Millbrook: 219	1–3	0–13	Silt loam	CL	A–6 or A–7
		13–50	Silty clay loam, clay loam, and sandy clay loam.	CL	A–6 or A–7
		50–60	Stratified silt loam, loam, and sandy loam.	SM, CL, or SC	A–2, A–4, or A–6
Montmorenci: 57C2	2–4	0–8	Silt loam	ML or CL	A–4 or A–6
		8–37	Clay loam and silty clay loam	CL	A–6 or A–7
		37–60	Loam	ML or CL	A–4 or A–6
Nappanee: 228D3	1–3	0–4	Clay loam or silty clay loam	CL or ML	A–6 or A–4
		4–18	Silty clay loam and silty clay	CH	A–7
		18–60	Silty clay and clay	CH or CL	A–7
Pella: 153	0–2	0–18	Silty clay loam	CL, OH, or MH	A–7 or A–6
		18–38	Silty clay loam	CL	A–6 or A–7
		38–60	Sandy loam, loam, silt loam, or silty clay loam.	SM or ML	A–2 or A–4
Peotone: 330	0–2	0–21	Silty clay loam	CL	A–7
		21–53	Silty clay loam and silty clay	CL or CH	A–7
		53–60	Sandy loam, loam, or silt loam	SM, SC, CL, or ML	A–2, A–4, or A–6
Plano: 199B	2–6	0–14	Silt loam	ML or CL	A–4 or A–6
		14–44	Silty clay loam	CL	A–6
		44–60	Sandy loam, silt loam, loam, and sandy clay loam.	ML or SM	A–4 or A–2

properties of the soils—Continued

Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity: Uncoated steel	Corrosivity: Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	100	90–100	0.63–2.0	0.20–0.25	5.6–6.5	Low	(1)	(1).
100	100	95–100	0.63–2.0	0.19–0.21	5.6–6.5	Moderate	High	Moderate.
90–100	80–90	25–60	0.63–6.3	0.14–0.18	6.1–7.3	Low	Moderate	Low.
95–100	90–100	70–90	0.63–2.0	0.20–0.25	5.1–6.5	Low	(1)	(1).
95–100	90–100	60–85	0.2–2.0	0.16–0.19	5.1–6.5	Moderate	High	Moderate.
90–100	90–100	50–80	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	High	Low.
100	100	95–100	0.63–2.0	0.20–0.25	5.6–6.5	Low	(1)	(1).
100	95–100	95–100	0.63–2.0	0.19–0.21	5.1–6.5	Moderate to high	High	Moderate.
95–100	85–95	55–75	0.2–2.0	0.18–0.20	7.4–8.4	Low to moderate	High	Low.
95–100	95–100	70–100	0.63–2.0	0.19–0.23	7.4–8.4	Moderate	(1)	(1).
95–100	80–100	65–100	0.63–2.0	0.16–0.19	7.4–8.4	Moderate	High	Low.
90–100	80–100	30–100	0.63–2.0	0.10–0.19	7.4–8.4	Low to moderate	High	Low.
100	95–100	80–95	0.63–2.0	0.20–0.25	6.1–7.3	Low	(1)	(1).
95–100	90–100	60–90	0.63–2.0	0.16–0.19	5.1–6.0	Moderate	Moderate	Moderate.
90–100	80–95	30–80	0.63–6.3	0.12–0.16	6.1–7.3	Low to moderate	Low	Low.
100	95–100	90–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	(1)	(1).
100	95–100	90–100	0.2–2.0	0.18–0.20	5.1–6.5	Moderate	High	Moderate.
95–100	85–95	25–60	0.63–6.3	0.12–0.16	6.6–7.8	Low	Moderate	Low.
95–100	95–100	90–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	(1)	(1).
95–100	90–100	85–100	0.2–0.63	0.19–0.21	6.1–7.3	Moderate to high	High	Low.
95–100	90–100	90–100	<0.20	0.15–0.18	7.4–8.4	High	High	Low.
100	95–100	85–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	High	Low.
95–100	85–95	55–95	0.63–2.0	0.16–0.20	6.1–7.3	Low	High	Low.
100	95–100	55–80	0.63–2.0	0.16–0.20	5.6–6.5	Low to moderate	(1)	(1).
95–100	90–100	60–80	0.63–2.0	0.16–0.19	5.6–7.3	Moderate	Moderate	Moderate.
95–100	85–95	50–80	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	Moderate	Low.
100	95–100	95–100	0.63–2.0	0.19–0.23	6.1–7.3	High	(1)	(1).
95–100	90–100	85–100	0.06–0.63	0.19–0.21	6.6–7.8	High	High	Low.
95–100	90–100	85–100	0.06–0.63	0.15–0.18	7.4–8.4	High	High	Low.
100	95–100	90–100	0.63–2.0	0.20–0.25	5.6–6.5	Low	(1)	(1).
100	90–100	60–90	0.20–2.0	0.16–0.19	6.1–7.3	Moderate	High	Low.
95–100	90–100	30–80	0.63–2.0	0.12–0.16	6.6–7.8	Moderate to low	High	Low.
100	95–100	85–95	0.63–2.0	0.20–0.25	6.1–7.3	Low	(1)	(1).
100	95–100	70–95	0.63–2.0	0.16–0.19	5.1–6.5	Moderate	Moderate	Moderate.
95–100	85–95	55–80	0.2–2.0	0.14–0.18	7.4–8.4	Low	Moderate	Low.
95–100	95–100	90–100	0.2–0.63	0.19–0.23	6.1–7.3	Low	(1)	(1).
95–100	90–100	85–100	<0.20	0.15–0.18	6.6–7.8	Moderate	High	Moderate.
95–100	90–100	85–100	<0.20	0.15–0.18	7.4–8.4	Moderate	High	Low.
100	100	80–100	0.63–2.0	0.20–0.25	6.1–7.8	Moderate	(1)	(1).
100	100	80–95	0.63–2.0	0.19–0.21	7.4–8.4	Moderate	High	Low.
95–100	90–100	25–60	0.63–2.0	0.14–0.18	7.4–8.4	Low	High	Low.
95–100	90–100	85–100	0.63–2.0	0.19–0.23	5.6–6.5	Moderate	(1)	(1).
95–100	90–100	85–100	0.2–0.63	0.19–0.21	6.6–7.8	Moderate	High	Low.
90–100	80–100	30–75	0.63–2.0	0.19–0.21	7.4–8.4	Low to moderate	High	Low.
100	100	95–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	(1)	(1).
100	100	95–100	0.63–2.0	0.19–0.21	5.6–6.5	Low to moderate	Moderate	Moderate.
90–100	80–90	25–60	0.63–6.3	0.10–0.14	6.6–7.8	Low	Low	Low.

TABLE 5.—*Estimated engineering*

Soil series and map symbols	Depth to seasonally high water table	Depth from surface	Classification: Dominant USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Inches*			
Proctor: 148B	2–6	0–10	Silt loam	CL	A–6 or A–7
		10–36	Silty clay loam, clay loam, and sandy clay loam.	CL	A–6 or A–7
		36–60	Stratified sandy loam, loam, and silt loam.	SM, SC, or CL	A–2, A–4, or A–6
Raub: 481A, 481B	1–3	0–16	Silt loam	CL or OL	A–6 or A–7
		16–46	Silty clay loam and clay loam	CL	A–6 or A–7
		46–60	Loam	ML or CL	A–4 or A–6
Ridgeville: 151	1–3	0–18	Fine sandy loam	SM or ML	A–4 or A–2
		18–50	Sandy clay loam and clay loam	SC or CL	A–6
		50–60	Loamy sand and sand	SM or SP	A–2 or A–3
Russell: 322C2, 322C3, 322D2.	3–6	0–6	Silt loam	ML or CL	A–4 or A–6
		6–58	Silty clay loam and clay loam	CL	A–6
		58–60	Loam	ML or CL	A–4 or A–6
Rutland: 375A, 375B	1–3	0–13	Silt loam	CL or OL	A–6 or A–7
		13–47	Silty clay loam	CL	A–6 or A–7
		47–60	Silty clay and clay	CH	A–7
Sabina: 236A, 236B	1–3	0–12	Silt loam	ML or CL	A–6
		12–43	Silty clay loam	CL	A–7 or A–6
		43–60	Loam and clay loam	ML or CL	A–4 or A–6
St. Charles: 243B	3–6	0–11	Silt loam	CL or ML	A–6 or A–4
		11–42	Silty clay loam	CL	A–6
		42–60	Sandy loam to clay loam	SM, SC, or CL	A–2, A–4, or A–6
Sawmill: 107, W107	0–2	0–31	Silty clay loam	CL, CH, or MH	A–7
		31–60	Silty clay loam	CL	A–6 or A–7
Sexton: 208	0–2	0–15	Silt loam	ML or CL	A–4 or A–6
		15–36	Silty clay loam and clay loam	CL or CH	A–6 or A–7
		36–60	Sandy clay loam to sandy loam	SM, SC, or CL	A–2, A–4, or A–6
Starks: 132	1–3	0–11	Silt loam	CL	A–6 or A–4
		11–50	Silty clay loam and sandy clay loam.	CL	A–6 or A–7
		50–60	Stratified loamy sand, loam, and sandy loam.	SM, ML, or SC	A–2, A–4, or A–6
Strawn: 224E2, 224F2	3–6	0–7	Silt loam or loam	ML or CL	A–4 or A–6
		7–16	Silty clay loam and clay loam	CL	A–6 or A–7
		16–60	Loam	ML or CL	A–4 or A–6
Sunbury: 234A, 234B	1–3	0–12	Silt loam	ML or CL	A–6
		12–43	Silty clay loam	CL	A–7 or A–6
		43–60	Loam	ML or CL	A–6 or A–4
Toronto: 353A, 353B	1–3	0–13	Silt loam	ML or CL	A–4 or A–6
		13–43	Silty clay loam and clay loam	CL	A–6
		43–60	Loam	ML or CL	A–4 or A–6
Wabash: W83	0–2	0–33	Silty clay	CH or OH	A–7
		33–60	Silty clay to clay loam	CH or CL	A–7
Xenia: 291B	2–4	0–12	Silt loam	ML or CL	A–4 or A–6
		12–49	Silty clay loam and clay loam	CL	A–6
		49–60	Loam	ML or CL	A–4 or A–6

[1] Corrosivity is estimated only for the horizons in which conduits are likely to be buried.

properties of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	95–100	80–95	0.63–2.0	0.20–0.25	6.1–7.3	Low	([1])	([1]).
95–100	90–100	60–90	0.63–2.0	0.18–0.20	5.6–6.5	Moderate	Moderate	Moderate.
90–100	80–95	30–80	0.63–6.3	0.12–0.16	6.6–7.8	Low to moderate	Moderate	Low.
100	100	85–95	0.63–2.0	0.20–0.25	5.6–7.3	Low	([1])	([1]).
100	100	65–95	0.20–2.0	0.16–0.19	5.6–6.5	Moderate	High	Moderate.
100	85–95	60–70	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	High	Low.
100	95–100	30–60	0.63–6.3	0.11–0.13	6.1–7.3	Low	([1])	([1]).
100	95–100	40–70	0.63–6.3	0.14–0.16	5.6–6.5	Moderate	Moderate	Moderate.
100	95–100	10–35	2.0–20.0	0.06–0.10	6.6–7.8	Low	Moderate	Low.
100	95–100	80–100	0.63–2.0	0.20–0.25	5.6–6.5	Low to moderate	([1])	([1]).
95–100	90–100	70–95	0.63–2.0	0.16–0.19	5.1–6.0	Moderate	Moderate	Moderate.
95–100	85–95	55–75	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	Moderate	Low.
95–100	95–100	90–100	0.63–2.0	0.20–0.25	5.6–6.5	Low	([1])	([1]).
95–100	90–100	85–100	0.2–0.63	0.19–0.21	6.1–7.3	Moderate to high	High	Low.
95–100	90–100	90–100	<0.20	0.15–0.18	7.4–8.4	High	High	Low.
100	100	95–100	0.63–2.0	0.20–0.25	5.1–6.0	Low	([1])	([1]).
100	95–100	95–100	0.2–2.0	0.19–0.21	5.6–6.5	Moderate	High	Moderate.
95–100	85–95	55–75	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	High	Low.
100	100	95–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	([1])	([1]).
100	100	95–100	0.63–2.0	0.16–0.19	5.6–6.5	Moderate	Moderate	Moderate.
90–100	80–90	25–60	0.63–6.3	0.10–0.14	5.6–7.3	Low	Low	Moderate.
100	95–100	90–100	0.63–2.0	0.19–0.23	6.1–7.3	Moderate	High	Low.
95–100	90–100	80–100	0.20–2.0	0.19–0.21	6.1–7.3	Moderate	High	Low.
100	100	90–100	0.2–0.63	0.20–0.25	5.1–6.0	Low	([1])	([1]).
100	100	90–100	0.06–0.2	0.19–0.21	4.5–6.0	Moderate	High	Moderate.
100	95–100	30–80	0.63–6.3	0.10–0.14	6.1–7.3	Low to moderate	High	Low.
100	95–100	80–95	0.63–0.20	0.20–0.25	5.6–6.5	Low	([1])	([1]).
95–100	90–100	60–90	0.2–2.0	0.16–0.19	5.1–6.0	Moderate	High	Moderate.
90–100	80–95	30–80	0.63–2.0	0.08–0.12	5.6–7.3	Low	High	Moderate.
100	90–100	80–100	0.63–2.0	0.20–0.25	6.1–7.3	Low	([1])	([1]).
95–100	90–100	70–95	0.63–2.0	0.16–0.18	6.1–7.8	Moderate	Moderate	Low.
95–100	85–95	55–75	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	Moderate	Low.
100	100	95–100	0.63–2.0	0.20–0.25	5.6–6.5	Low	([1])	([1]).
100	95–100	95–100	0.20–2.0	0.19–0.21	5.6–6.5	Moderate	High	Moderate.
95–100	85–95	55–75	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	High	Low.
100	95–100	85–95	0.63–2.0	0.20–0.25	5.1–6.0	Low	([1])	([1]).
100	95–100	65–95	0.2–2.0	0.16–0.19	5.1–6.5	Moderate	High	Moderate.
100	95–100	60–70	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	High	Low.
100	100	95–100	0.06–0.2	0.16–0.19	6.1–7.3	High	([1])	([1]).
100	100	90–100	<0.2	0.15–0.18	6.1–7.3	High	High	Low.
100	95–100	85–95	0.63–2.0	0.20–0.25	5.1–6.5	Low	([1])	([1]).
100	95–100	60–85	0.63–2.0	0.16–0.19	4.5–6.0	Moderate	Moderate	Moderate.
95–100	90–100	50–80	0.2–2.0	0.14–0.18	7.4–8.4	Low to moderate	Moderate	Low.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand	Highway subgrade material	Soil features affecting suitability for— Highway location	Winter grading	Foundations for low buildings [1]
Alvin: 131B	Fair in surface layer; somewhat sandy.	Poor above 36 inches; good source of sand below; poorly graded.	Subsoil fair; underlying material fair to good.	Loose sand hinders hauling operations; exposed sand is highly erodible.	Susceptibility to freezing hard; varies with moisture content.	Moderately well drained to well drained; sandy; slight compressibility; low shrink-swell potential; fair to good shear strength.
Brenton: 149	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor; underlying material fair to poor.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium to slight compressibility; low shrink-swell potential; fair shear strength.
Brooklyn: 136	Good in upper 9 inches of surface layer; fair in next 9 inches; low organic matter content.	Not suitable above 50 inches; poor to fair source below; contains some fines in places.	Subsoil poor; underlying material fair to poor.	High water table; high susceptibility to frost heave; plastic in upper 3 feet.	High susceptibility to freezing hard; high water table.	High water table; subsoil is clayey and plastic and has high shrink-swell potential and poor shear strength; underlying material has medium compressibility, low to moderate shrink-swell potential, and fair shear strength.
Camden: 134A, 134B, 134C2, 134D2, 134D3.	Good if surface layer is slightly eroded; fair if eroded; poor if severely eroded.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Some cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained; medium to low compressibility; low shrink-swell potential; fair to good shear strength.
Catlin: 171B	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained to moderately well drained; medium compressibility; low to moderate shrink-swell potential; fair shear strength.

interpretations

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Material too porous to hold water.	Sandy material; poor resistance to piping; rapid seepage rate.	Natural drainage is adequate.	Moderate water-holding capacity; rapid intake rate; hazard of soil blowing.	Sandy substratum; difficult to vegetate; topography not suited in some places.	Sandy substratum; highly erodible; difficult to vegetate.		Slight: nearby water supply subject to contamination in some areas.
Less than 3 feet to water table; upper 3 to 4 feet is normally suitable; in some areas it is too porous to hold water below that depth.	Fair to good compaction and stability; impervious when compacted; medium volume change; material taken from a depth below 3 to 4 feet has piping hazard.	Moderately permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately permeable; high water-holding capacity.	Not needed, because of topography.	Soil properties are favorable, except need for subsurface drainage.		Moderate: seasonally high water table; moderately permeable.
Upper 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth; high water table.	Fair to poor stability and compaction; slow compacted permeability of upper 5 feet of material; high volume change likely; underlying material is subject to seepage and piping.	Slowly permeable; high water table; subsurface drainage is difficult; surface drainage is best if outlets are available.	Slow intake rate; slowly permeable soil; high water table; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Severe: high water table; slowly permeable.
Upper 3 to 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth.	Fair to good compaction and stability; impervious when compacted; medium volume change.	Natural drainage is adequate.	Sloping soils have a severe erosion and high runoff hazard; medium intake rates; moderately permeable; moderate to high water-holding capacity.	Terraces are not suitable where slope exceeds 12 percent.	Soil properties are favorable, except need for subsurface drainage in some areas.		Slight for 134A and 134B; moderate for 134C2, 134D2, and 134D3; slope; moderately permeable.
Features are generally favorable; sand pockets below a depth of 5 feet in some places.	Fair to good compaction and stability; impervious when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some areas.		Slight.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting suitability for—		
	Topsoil	Sand	Highway subgrade material	Highway location	Winter grading	Foundations for low buildings [1]
Dana: 56B	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Some cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Moderately well drained; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Drummer: 152 +, 152.	Fair to a depth of 16 inches; high clay content; seasonally high water table.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor; underlying material fair to poor.	High water table; high susceptibility to frost heave.	High susceptibility to freezing hard; high water table.	High water table; variable substrata; generally medium compressibility, moderate shrink-swell potential, and fair shear strength.
Elburn: 198A, 198B.	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor; underlying material fair to good.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; slight to medium compressibility; low shrink-swell potential; fair shear strength.
Fincastle: 496A, 496B.	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Flanagan: 154A, 154B.	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Harpster: 67	Fair in surface layer; silty clay loam texture; calcareous; seasonally high water table.	Not suitable above 50 inches; poor to fair source below; high water table.	Subsoil and underlying material poor.	High water table; high susceptibility to frost heave.	High susceptibility to freezing hard; high water table.	Low areas; subject to ponding and high water table; substratum variable, but generally has medium compressibility, low to moderate shrink-swell potential, and fair shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued						Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Reservoir areas	Embankments					
Features are generally favorable; sand pockets below a depth of 5 feet in some places.	Fair compaction and stability; impervious when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some areas.	Slight.
Upper 5 feet is normally suitable; in some areas soil is too porous to hold water below that depth; high water table.	Fair compaction and stability; impervious when compacted; medium volume change.	Moderately permeable; frequent high water table; subsurface drainage is satisfactory where outlets are adequate.	Moderate intake rate; moderately permeable; high water-holding capacity; high water table.	Not needed, because of topography.	Soil properties are favorable, except need for subsurface drainage.	Severe: water table frequently near surface.
Upper 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth; seasonally high water table.	Fair compaction and stability; impervious when compacted; medium volume change.	Moderately permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.	Moderate: seasonally high water table; permeability is less than 1 inch per hour in some places.
Generally slow seepage; sand pockets below a depth of 5 feet in a few places; seasonally high water table.	Fair compaction and stability; impervious when compacted; medium volume change; medium compressibility.	Moderately to moderately slowly permeable; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Moderately to moderately slowly permeable; medium to slow intake rate; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.	Moderate to severe: seasonally high water table; permeability is less than 1 inch per hour in some places.
Generally slow seepage; sand pockets below a depth of 5 feet in some places; seasonally high water table.	Fair to good stability and compaction; impervious when compacted; medium volume change.	Moderately permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.	Moderate: seasonally high water table; moderately permeable, but permeability is less than 1 inch per hour in some places.
Topography not favorable in all places; in some places there are sand or silt layers or pockets below a depth of 5 feet; has natural high water table for dugout ponds.	Not ordinarily used for pond embankment, because of topographic position, wetness, and poor quality of material.	Moderately permeable; frequent high water table; subsurface drainage is satisfactory if outlets are adequate.	Moderate intake rate; high water table; moderately permeable; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.	Severe: high water table and local ponding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting suitability for—		
	Topsoil	Sand	Highway subgrade material	Highway location	Winter grading	Foundations for low buildings[1]
Harvard: 344B, 344C2.	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor; underlying material fair to poor.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained; medium to slight compressibility; low to moderate shrink-swell potential; fair to good shear strength.
Kendall: 242	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; slight to medium compressibility; low shrink-swell potential; fair shear strength.
Kernan: 554A, 554B.	Good in surface layer.	Not suitable	Subsoil and underlying material poor.	Seasonally high water table; high plasticity; moderate to high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; moderately slowly permeable; high shrink-swell potential and high compressibility; poor to fair shear strength.
Lawson: 451	Good if protected from flooding.	Not suitable above 60 inches; poor to fair source below; high water table.	Upper 3 feet very poor; underlying material poor.	Subject to flooding; occasional high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; occasional high water table.	Occasional high water table; subject to flooding; medium to high compressibility; low shrink-swell potential; fair to poor shear strength; easily liquefies when wet.
Miami: 27C2, 27C3, 27D2, 27D3.	Fair if surface layer is eroded; poor if severely eroded.	Not suitable	Subsoil poor; underlying material fair to poor.	Some cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained; medium to slight compressibility; low to moderate shrink-swell potential; fair shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Upper 5 feet is normally suitable; in some areas the material is too porous to hold water below a depth of 5 feet.	Fair to good stability and compaction; impervious when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some areas.		Slight for 344B; moderate for 344C2; slope; moderately permeable.
Upper 5 feet is normally suitable; in some areas the material is too porous to hold water below a depth of 5 feet; seasonally high water table.	Fair stability and compaction; impervious when compacted; medium volume change.	Moderately to moderately slowly permeable; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Moderately to moderately slowly permeable; medium intake rate; high water-holding capacity.	Not needed, because of topography.	Soil properties are favorable, except need for subsurface drainage.		Moderate: seasonally high water table and moderately to moderately slowly permeable; hazard of contaminating nearby underground water supply.
Features are generally favorable; sand or silt layer below a depth of 5 feet in some places; seasonally high water table.	Fair to poor compaction and stability; high volume change; highly impervious when compacted.	Moderately slowly permeable to a depth of 42 inches; slowly permeable below that depth; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Moderately slowly permeable; medium to slow intake rate; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.		Severe: moderately slowly permeable; seasonally high water table.
High organic-matter content; silty sediments; sand layers below a depth of 5 feet in some places; occasional high water table.	Poor to fair stability and compaction; slow to moderate permeability when compacted; high organic-matter content in upper 3 feet; slight volume change; generally poor resistance to piping.	Moderately permeable; occasional high water table; subject to flooding; needs subsurface drainage if outlets are available; if not, surface drainage.	Subject to occasional flooding; medium intake rate; moderately permeable; very high water-holding capacity; occasional high water table.	Not needed, because of topography.	Not needed, because of topography.		Severe: subject to flooding; occasionally high water table.
Features are generally favorable; sand pockets below a depth of 3 feet in some places.	Fair stability and compaction; slow permeability when compacted; medium volume change.	Natural drainage is adequate.	Eroded areas have high runoff and severe erosion hazard; medium to slow intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable.		Moderate: moderately permeable, but permeability ranges to less than 1 inch per hour in some places; difficulty of installation, because of slope.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting suitability for—		
	Topsoil	Sand	Highway subgrade material	Highway location	Winter grading	Foundations for low buildings [1]
Milford: 69	Fair in surface layer; clayey; high water table.	Not suitable	Subsoil and underlying material poor.	High water table; high plasticity; high susceptibility to frost heave; high shrink-swell potential.	High susceptibility to freezing hard; high water table.	High water table; high shrink-swell potential; high compressibility; poor shear strength.
Millbrook: 219	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium to slight compressibility; low to moderate shrink-swell potential; fair to good shear strength.
Montmorenci: 57C2.	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Some cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Moderately well drained; medium compressibility; low shrink-swell potential; fair shear strength.
Nappanee: 228D3.	Fair; surface layer is thin.	Not suitable	Subsoil and underlying material poor to very poor.	Seasonally high water table; some cutting and filling needed; high plasticity; poor workability; high susceptibility to frost heave; high shrink-swell potential.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; seepage into foundations likely; plastic clay; high compressibility and moderate shrink-swell potential; poor shear strength.
Pella: 153	Fair in surface layer; silty clay loam texture; high water table.	Not suitable	Subsoil poor to fair; underlying material fair to poor.	Low areas subject to ponding; high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; high water table.	Low areas subject to ponding; high water table; medium to slight compressibility; low shrink-swell potential; fair shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Material is generally suitable if topography is favorable; silt or sand layer below a depth of 4 feet in some places; has natural high water table for dugout ponds.	Poor to fair stability and compaction; impervious when compacted; high volume change; high water table.	Moderately slowly to slowly permeable; high water table; tile and surface drainage function best.	Slow intake rate; moderately slowly to slowly permeable; high water table; high water-holding capacity.	Not needed, because of topography.	Waterways are not crossable with machinery during wet periods.		Severe: high water table and moderately slowly to slowly permeable.
Upper 3 to 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth; seasonally high water table.	Fair to good stability and compaction; upper 5 feet of material is impervious when compacted; medium volume change; underlying material subject to piping and seepage.	Moderately to moderately slowly permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately to moderately slowly permeable; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Moderate: seasonally high water table; moderately to moderately slowly permeable; hazard of contaminating nearby underground water supply.
Features are generally favorable; sand pockets below a depth of 5 feet in a few places.	Fair compaction and stability; impervious when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some areas.		Moderate: moderately sloping; permeability less than 1 inch per hour in some places.
Features are generally favorable; silt or sand layer below a depth of 3 feet in some places; seasonally high water table.	Fair to poor compaction and stability; medium volume change and compressibility; highly impervious when compacted; poor workability; good for core material.	Slowly permeable to very slowly permeable; seasonally high water table; subsurface drainage is difficult.	Slow intake rate; high runoff and severe erosion hazard; slowly permeable to very slowly permeable; productivity of soil when irrigated should be considered.	Clayey substratum; difficult to vegetate; topography not suitable in some places.	Clayey substratum; difficult to vegetate.		Severe: slowly permeable to very slowly permeable; impervious material at a depth of less than 2 feet.
Topography not favorable in all places; in some areas soil is too porous to hold water below a depth of 5 feet; has natural high water table for dugout ponds.	Not ordinarily used for pond embankments, because of topographic position, wetness, and poor quality material.	Moderately permeable; high water table; subsurface drainage is satisfactory if outlets are adequate.	Moderate intake rate; high water table; moderately permeable; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Severe: high water table; subject to ponding in some places.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand	Highway subgrade material	Soil features affecting suitability for— Highway location	Winter grading	Foundations for low buildings [1]
Peotone: 330	Fair if surface layer is thick; clayey; high water table.	Not suitable	Subsoil poor; underlying material fair to poor.	Depressions; local ponding; high water table; high susceptibility to frost heave; plastic material in upper 5 feet.	High susceptibility to freezing hard; high water table.	Depressional areas; subject to local ponding; high water table; medium to high compressibility; low to moderate shrink-swell potential; fair shear strength.
Plano: 199B	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained to moderately well drained; slight to medium compressibility; low shrink-swell potential; fair shear strength.
Proctor: 148B	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor; underlying material fair.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Moderately well drained or well drained; medium to slight compressibility; low to moderate shrink-swell potential; fair shear strength.
Raub: 481A, 481B.	Good in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Ridgeville: 151	Fair in surface layer; somewhat sandy.	Poor above 45 inches; good source of sand below; poorly graded sand.	Subsoil fair to poor; underlying material good.	Seasonally high water table; loose sand hinders hauling operations; moderate susceptibility to frost heave in upper 3 feet.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; slight compressibility; low shrink-swell potential; fair to good shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Features are generally favorable; sand or silt layer or pocket below a depth of 5 feet in some places; has natural high water table for dugout ponds.	Fair to poor stability and compaction; medium volume change; impervious when compacted.	Moderately slowly permeable; high water table; needs surface and subsurface drainage; depressional; outlets difficult to locate.	Slow intake rate; moderately slowly permeable; high water table; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Severe: local ponding; high water table; moderately slowly permeable.
Upper 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth.	Fair stability and compaction; slow permeability when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.		Slight.
Upper 3 to 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth.	Fair to good stability and compaction; upper 5 feet of material has slow permeability when compacted; medium volume change; seepage or piping likely in underlying material.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some areas.		Slight.
Features are generally favorable; sand pockets below a depth of 5 feet in some places; seasonally high water table.	Fair compaction and stability; medium volume change; slow permeability when compacted.	Moderately to moderately slowly permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately to moderately slowly permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.		Moderate: seasonally high water table; moderately to moderately slowly permeable.
Material too porous to hold water; seasonally high water table.	Fair stability; fair to good compaction; slight volume change; material taken from below a depth of about 4 feet is subject to piping and rapid seepage.	Loose sand below a depth of 45 inches; seasonally high water table; in most places drainage not needed; surface drainage is most satisfactory.	Medium water-holding capacity; rapid intake rate; soil blowing is a hazard; moderately to moderately rapidly permeable.	Not needed, because of topography.	Not needed, because of topography.		Moderate: seasonally high water table; hazard of contaminating nearby underground water supply through sandy material.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand	Highway subgrade material	Soil features affecting suitability for— Highway location	Winter grading	Foundations for low buildings [1]
Russell: 322C2, 322C3, 322D2.	Fair if surface layer is eroded; poor if severely eroded.	Not suitable	Subsoil poor; underlying material fair to poor.	Some cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Rutland: 375A, 375B.	Good in surface layer.	Not suitable	Subsoil poor; underlying material very poor.	Seasonally high water table; high plasticity; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; moderately slowly permeable; high shrink-swell potential; high compressibility; poor to fair shear strength.
Sabina: 236A, 236B.	Fair in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
St. Charles: 243B.	Good in surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained to moderately well drained; slight to medium compressibility; low shrink-swell potential; fair shear strength.
Sawmill: 107, W107.	Fair if protected from flooding; poor if frequently flooded; thick, dark surface layer; somewhat clayey.	Not suitable	Very poor	Subject to flooding; high water table; high susceptibility to frost heave; poor stability when wet.	High susceptibility to freezing hard; high water table.	High water table; subject to flooding; moderate shrink-swell potential and compressibility; fair shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Features are generally favorable; sand pockets below a depth of 5 feet in some places.	Fair compaction and stability; slow permeability when compacted; medium volume change.	Natural drainage is adequate.	Medium to slow intake rate; moderately permeable; high water-holding capacity; water erosion hazard.	No limitations, except topography not suitable in some places.	Soil properties are favorable.		Moderate: generally moderately permeable, but permeability ranges to less than 1 inch per hour in some places; difficulty of installation because of slope.
Features are generally favorable; silt or sand layers below a depth of 5 feet in some places; seasonally high water table.	Fair to poor compaction and stability; high volume change; impervious when compacted; plastic material; poor workability.	Moderately slowly permeable to a depth of 42 inches; slowly permeable below that depth; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately slowly permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.		Severe: seasonally high water table; moderately slowly permeable to a depth of 42 inches; slowly permeable below that depth.
Features are generally favorable; sand pocket below a depth of 5 feet in some places; seasonally high water table.	Fair compaction and stability; slowly permeable when compacted; medium volume change.	Moderately to moderately slowly permeable; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Moderately to moderately slowly permeable; medium intake rate; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.		Moderate: seasonally high water table and moderately to modately slowly permeable.
Upper 4 feet is normally suitable; in some areas soil is too porous to hold water below that depth.	Fair compaction and stability; slow permeability when compacted; medium volume change.	Natural drainage is adequate.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage in some places.		Slight.
Sand or silt layer below a depth of 4 feet in some places; high organic-matter content; subject to flooding.	Not ordinarily used for embankment, because of high organic-matter content, topographic position, wetness, and poor quality material in general.	Moderately permeable to a depth of about 31 inches; high water table; subject to flooding; use of surface or subsurface drainage depends on availability of outlets.	Slow intake rate; high water table; subject to flooding; moderately permeable; very high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Severe: high water table and occasional to frequent flooding.

Table 6—Engineering

Soil series and map symbols	Suitability as a source of—			Soil features affecting suitability for—		
	Topsoil	Sand	Highway subgrade material	Highway location	Winter grading	Foundations for low buildings [1]
Sexton: 208	Fair; low in organic-matter content.	Not suitable above 50 inches; fair source below; poorly graded sands.	Subsoil poor; underlying material fair.	High water table; high susceptibility to frost heave; plastic subsoil.	High susceptibility to freezing hard; high water table.	High water table; medium to slight compressibility; low shrink-swell potential; fair shear strength.
Starks: 132	Fair; thin surface layer.	Not suitable above 50 inches; poor to fair source below; contains fines in places.	Subsoil poor to fair; underlying material fair.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium to slight compressibility; low shrink-swell potential; fair shear strength.
Strawn: 224E2, 224F2.	Poor; thin surface layer and steep slopes.	Not suitable	Subsoil poor; underlying material fair to poor.	Much cutting and filling needed; moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Well drained; steep slopes; possible slippage; medium compressibility; low to moderate shrink-swell potential; fair shear strength.
Sunbury: 234A, 234B.	Good in surface layer.	Not suitable	Subsoil poor to fair; underlying material fair to poor.	Seasonally high water table; moderate to high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Fair bearing capacity; seasonally high water table; low to moderate shrink-swell potential.
Toronto: 353A, 353B.	Good in surface layer.	Not suitable	Subsoil poor; underlying material poor to fair.	Seasonally high water table; high susceptibility to frost heave.	High susceptibility to freezing hard; seasonally high water table.	Seasonally high water table; medium compressibility; low to moderate shrink-swell potential; fair shear strength.

interpretations—Continued

Soil features affecting suitability for—Continued							Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Reservoir areas	Embankments						
Upper 3 to 4 feet is normally suitable; in most areas soil is too porous to hold water below that depth; high water table.	Fair stability; fair to good compaction; subsoil has slow permeability when compacted; underlying material is subject to seepage and piping.	Slowly permeable; high water table; subsurface drainage is difficult; surface drainage is best if outlets are available.	Moderate intake rate; slowly permeable; high water table; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Severe: high water table and slowly permeable.
Upper 4 feet is normally suitable; below a depth of 4 feet in some areas soil is too porous to hold water; seasonally high water table.	Medium volume change; fair stability; fair to good compaction; upper 4 feet of material has slow permeability when compacted; underlying material is subject to seepage and piping.	Moderately to moderately slowly permeable; seasonally high water table; surface or subsurface drainage needed only for seepy or lower areas.	Moderately to moderately slowly permeable; medium intake rate; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.		Moderate: moderately to moderately slowly permeable; seasonally high water table; hazard of contaminating nearby underground water supply.
Features are generally favorable; sand pockets below a depth of 3 feet in some places.	Fair compaction and stability; medium volume change; slowly permeable when compacted.	Natural drainage is adequate.	Steep slopes; high runoff and severe erosion hazard; productivity of soil when irrigated should be considered; medium to slow intake rate; moderately permeable subsoil.	Terraces and diversions not suitable, because of slope.	Soil properties are favorable; slopes hinder construction in some areas.		Severe: difficulty of installation because of steep slopes; effluent likely to seep to surface and cause contamination hazard.
Features are generally favorable; sand pockets below a depth of 5 feet in some places; seasonally high water table.	Fair compaction and stability; medium volume change; slow permeability when compacted.	Moderately to moderately slowly permeable; occasional high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately to moderately slowly permeable; high water-holding capacity.	No limitations, except topography not suitable in places.	Soil properties are favorable, except need for subsurface drainage.		Moderate: occasional high water table and moderately to moderately slowly permeable.
Features are generally favorable; sand pockets below a depth of 5 feet in some places; seasonally high water table.	Fair compaction and stability; medium volume change; slow permeability when compacted.	Moderately to moderately slowly permeable; seasonally high water table; subsurface drainage needed only for seepy or lower areas.	Medium intake rate; moderately to moderately slowly permeable; high water-holding capacity.	No limitations, except topography not suitable in places.	Soil properties are favorable, except need for subsurface drainage.		Moderate: seasonally high water table; moderately to moderately slowly permeable.

TABLE 6—*Engineering*

Soil series and map symbols	Suitability as a source of—			Soil features affecting suitability for—		
	Topsoil	Sand	Highway subgrade material	Highway location	Winter grading	Foundations for low buildings [1]
Wabash: W83	Not suitable; clayey; wet; frequently flooded.	Not suitable	Not suitable	Subject to frequent flooding; high water table; high susceptibility to frost heave; highly plastic clay; high shrink-swell potential.	High susceptibility to freezing hard; high water table; highly plastic clay.	Subject to flooding; high water table; slowly permeable; plastic clay of high compressibility, high shrink-swell potential, and poor shear strength.
Xenia: 291B	Fair in surface layer.	Not suitable	Subsoil poor; underlying material fair to poor.	Moderate susceptibility to frost heave.	High susceptibility to freezing hard.	Moderately well drained; medium compressibility; low to moderate shrink-swell potential; fair shear strength.

[1] Unless otherwise specified, estimates of compressibility, shrink-swell potential, and shear strength are those of the substratum, the material in which foundations are most likely to rest. Generally, this is the material underlying the subsoil, or that at a depth below about 4 feet. Engineers and others should not apply specific values to the estimates given.

the soil material is compacted at successively higher moisture content, assuming that the same amount of force is used in compacting the soil, the density of the compacted material increases until the "optimum moisture content" is reached. After that, the density decreases as the moisture content increases. The ovendry weight, in pounds per cubic foot, of the soil at the optimum moisture content is the "maximum dry density." Data on the relationship of moisture to density are important in planning earthwork, because generally the soil is most stable if it is compacted to about its maximum dry density when it is at approximately the optimum moisture content.

Estimated properties

In table 5 the soil series of the county and their mapping symbols are listed and several soil properties likely to affect engineering properties are described. The depth at which bedrock occurs is not given, because in this county bedrock is so far below the surface that it presents no problems in engineering.

The estimated range in percentage of material passing sieves Nos. 4, 10, and 200 reflects the normal range for a soil series. Most soils fall within the range given. The grain size, however, of any soil varies considerably, and it should not be assumed that all samples of a specific soil will fall within the range shown, nor that the engineering classification will invariably be as shown.

Permeability, as used in this survey, is the capability of the soil to transmit water. The ratings given in table 5 represent the "in place" permeability and were estimated by comparison, by layers, with soils of known permeability. Permeability is shown as the range in which each layer of the soil normally will fall.

Available water capacity is the amount of water in a moist soil, at field capacity, that can be used by plants. When the soil material is air dry, this amount of water will wet it to a depth of 1 inch without deeper percolation.

Reaction refers to the pH value of the soil. The pH gives an indication of the corrosiveness of the soil solution and the protection needed for structures, such as pipelines, when placed in the soil.

Shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. Generally, soils that have high shrink-swell potential present hazards to the maintenance of engineering structures constructed in, on, or with such materials.

Corrosivity is influenced by soil texture, by the amount and kind of clay, by acidity, and by the moisture content of the soil. In table 5 it is estimated for the soil horizons in which conduits or pipes would likely be buried. Where there is a range of properties, such as acidity, the estimates of corrosivity are based on the least favorable end of the range.

Engineering interpretations

Table 6 gives the suitability of soil material for certain uses and describes specific characteristics that affect the design and application of engineering structures. Some of the significant soil features related to construction and maintenance are described in the table.

interpretations—Continued

Soil features affecting suitability for—Continued						Degree and kind of limitations for septic tank disposal fields
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Reservoir areas	Embankments					
Unfavorable sites because soil is on flood plains; frequent flooding; wetness; poor workability; the material is impervious plastic clay.	Plastic clay; poor workability; poor stability and compaction; impervious when compacted; high compressibility and high volume change.	Slowly permeable; high water table; subject to frequent flooding; subsurface drainage is difficult; surface drainage is best if outlets are available.	Water intake rate varies with amount of vertical cracking in this clayey, plastic soil; slowly permeable; high water table; subject to flooding; high water-holding capacity.	Not needed, because of topography.	Not needed, because of topography.	Severe: high water table; frequent flooding; slowly permeable.
Features are generally favorable; sand pockets below a depth of 5 feet in some places.	Fair compaction and stability; medium volume change; slow permeability when compacted.	Natural drainage is adequate for commonly grown crops.	Medium intake rate; moderately permeable; high water-holding capacity.	No limitations, except topography not suitable in some places.	Soil properties are favorable, except need for subsurface drainage.	Moderate: generally moderately permeable, but permeability is less than 1 inch per hour in some places.

Ratings are given for the suitability of the soil material as a source of topsoil and sand. Ratings for suitability as a source of gravel are not given, because there is so little gravel in Douglas County that preparation of estimates was not worthwhile. The soils are rated poor or fair as a source of topsoil if the soils are eroded, are low in organic-matter content or natural fertility, or have a heavy and sticky topsoil that is difficult to handle or work. Soils rated as possible sources of sand may require extensive probing to find suitable material.

Suitability ratings for highway subgrade material are based on the performance of the soil material when excavated and used as borrow material for highway subgrade. Generally, the most desirable soil material is sand. It is affected the least by adverse weather and can be worked during the greatest number of months in the year. The least desirable materials are clays or organic materials. In table 6, the subsoil and underlying material are rated good, fair, poor, or very poor or are shown as having a range of suitability where the properties vary. Highway engineers, roadbuilders, and others can refer to table 5 for specific soil properties on which the ratings are based, such as classification of materials by the AASHO and Unified systems.

In general, soil features affecting suitability for engineering practices were rated in table 6 according to the severity of the problems they might cause during construction and in maintenance of engineering works. The soil features shown for a given soil were based on the normal profile of that soil. Variation in the profile may change the ratings of the soil for use in some kinds of structures or practices.

The factors considered in highway location are those features and qualities of the soil that affect the overall performance of the soil for the location of highways. The entire profile was evaluated, based on an undisturbed soil without artificial drainage. It should be assumed that the surface soil, because of its higher organic-matter content, will be removed in construction and will be used for topsoil.

The suitability of the soils for winter grading depends upon the ease with which the soil can be moved and traversed by ordinary construction equipment in winter.

The factors considered in describing features that affect foundations for low buildings are those properties and qualities of undisturbed soils that affect suitability for supporting foundations of low buildings less than three stories high. Foundations and basements are subject to wetness if placed in soils that have a natural high water table. Estimates of other soil features affecting stability of foundations are based on the substratum material at a depth of about 4 to 6 feet, unless otherwise specified.

The ratings of limitations for septic tank disposal fields were based mainly on the ease with which water moves through the soil and the depth to the seasonal or normal water table. When installing septic tanks, the engineer should consider closeness of the tile to wells, in relation to permeability of the soil. A slight limitation indicates there are no unfavorable features. If the soils are rated as having a moderate or severe limitation for adequate movement of effluent into the soil, the features that cause such a limitation are described. Some of the soils, such as those of the Alvin series, transmit effluent rapidly enough that nearby underground water supplies can be contaminated. Such a hazard is noted, along with the rating, and special investigation at the site should be made.

Factors affecting farm pond reservoir areas are those features and qualities of undisturbed soils that affect their suitability for water impoundments or reservoirs. Clays, such as those of the Nappanee series, will hold water. Sands, such as those of the Alvin series, are not suitable.

The factors considered in farm pond embankments are those features and qualities of disturbed soils that affect their suitability for constructing pond embankments.

In the agricultural drainage column, the factors considered are those characteristics and qualities of the soils that make drainage necessary and affect the installation and performance of surface and subsurface drainage practices.[10] Well drained and moderately well drained soils do not need drainage.

Features described in the irrigation column of the table are those characteristics and qualities of the soils that affect their suitability for this use. For example, when sprinkler irrigation is to be used, topography as a factor is less critical than it would be in a gravity flow system.[11]

The factors indicated under the terraces and diversions column are those characteristics and qualities of the soils that affect the establishment, growth, and maintenance of vegetative cover. The descriptions include factors that hinder layout and construction. Moderately steep and steep areas are generally not suitable for terracing. Terraces and diversions are generally not needed on poorly drained soils.

In the column headed "Grassed waterways" are those features and qualities of the soils that affect the establishment, growth, and maintenance of vegetative cover and the factors that hinder layout and construction. Grassed waterways are generally not needed in level to nearly level areas.

The information in the engineering tables can be useful also in planning for development of urban fringe areas. Some of the properties and features given in the engineering tables and their application for urban development are as follows:

1. The depth to the water table is important if a basement is to be constructed.
2. Reaction, available water capacity, and texture of the surface layer influence the growth and kind of lawn plants, shrubbery, and trees.
3. Limitations and features affecting septic tank disposal fields must be considered if a house is not to be connected to sewers.
4. The information given for foundations for low buildings will aid in determining problems to be expected in construction and upkeep of small buildings.
5. The highway subgrade material and highway location columns present features that influence the construction and upkeep of roads.

[10] University of Illinois Extension Service and Agricultural Experiment Station and U.S. Dept. Agr., Soil Conservation Service. drainage guide for illinois. 47 pp., illus. Mimeo. (n.d.)

[11] University of Illinois Extension Service and Agricultural Experiment Station and U.S. Dept. Agr., Soil Conservation Service. irrigation guide for illinois. Bulletin AEng-866, 33 pp., illus. Mimeo. 1965.

Formation and Classification of the Soils

This section discusses the major factors of soil formation as they relate to the soils of Douglas County and the system of classifying soils into categories broader than the series.

Factors of Soil Formation

The kinds of soils in an area and how they developed are the result of the interaction of five soil-forming factors—parent material, climate, plant and animal life, relief and drainage, and time. Different combinations of the five soil-forming factors and varying intensity of their actions result in different kinds of soil. Man, through such activities as clearing of forests, drainage, cultivation, and fertilization, may change the course of soil formation, but thus far, he has had little overall effect on development of the soils in Douglas County.

Parent material

Parent material in Douglas County is of glacial origin and of Wisconsinan age. There are three morainal ridges in the county. The Cerro Gordo moraine, the oldest, is in the southeastern part of the county. The Arcola moraine, which is not very prominent, is just north of the Cerro Gordo. It also occurs near the south-central county line, turns northward near Arcola, but remains east of the Kaskaskia River. The West Ridge moraine, which is near Camargo, occurs in the north-central and northeastern parts of the county.

The morainal ridges and the more nearly level till plains between the ridges consist of glacial till that has a texture of loam to silt loam. A large, nearly level lake plain, formerly occupied by glacial Lake Douglas, occurs between the Arcola and the West Ridge moraines in the central and northeastern parts of the county (*6*). The lake sediments, of silty clay loam to silty clay texture, were deposited behind or to the north and east of the Arcola moraine when it blocked the Embarras River. There are relatively small areas of water-deposited sediments, of sandy loam texture, throughout the county and especially along the Embarras River. These sediments are the parent material of soils of the Alvin and Ridgeville series.

In most places the soils have been influenced by loess deposits, which range in thickness from about 15 inches on morainal ridges to as much as 55 inches on the level areas in the northwestern part of the county (*5*). The soils of association 2 and in parts of association 6 formed in about 18 to 40 inches of loess over till or medium-textured outwash material. The soils of association 3 (glacial Lake Douglas) formed in about 2½ to 4 feet of loess over silty clay loam to silty clay lakebed sediments. On some of the steeper slopes on the morainal ridges and along stream valleys, a few soils, such as those of the Strawn and Nappanee series, formed mainly from glacial till or lakebed sediments exposed by erosion. The bottom-land soils formed in recent stream sediments. Except for the alluvium on bottom lands, the parent material of Douglas County soils was calcareous when deposited and has been leached to various depths.

Climate

The climate of Douglas County is conducive to the breakdown of soil minerals, the formation of clay, and the movement of these materials downward in the profile. Except for the level, low-lying, heavy soils, such as those of the Drummer, Harpster, Milford, Pella, Peotone, Sawmill, and Wabash series, the soils have considerably more clay in the subsoil than in the surface layer.

Plant and animal life

The native vegetation in Douglas County consisted mostly of prairie grasses and forest. The soils that formed under grass have a dark-colored surface layer that is high in organic-matter content. Most of the wooded areas were on slopes bordering stream valleys and on less sloping adjoining areas. The soils that formed under forest vegetation have a surface layer that is lighter colored than that of soils that formed under grass, and the organic-matter content is lower. A few soils, such as those of the Millbrook, Sunbury, and Toronto series, formed along the prairie-forest border, where forest fairly recently had invaded the prairie areas. In these areas the soils are moderately dark colored because of the influence of the earlier prairie grass vegetation.

The alluvial soils probably had a mixed prairie grass-forest cover, but they are dark colored, primarily because of dark-colored sediments rather than grass vegetation.

Earthworms and burrowing animals help to keep soils open and porous. Bacteria and fungi hasten the decomposition of vegetation and, thus, release plant nutrients.

Relief and drainage

Relief influences the amount of runoff and, consequently, the degree of erosion and also the amount of water that infiltrates and percolates through the profile. In areas where the soils formed in uniform, permeable parent material, such as loess, the natural drainage is closely associated with slope. The moderately well drained and well drained soils are on the more rolling areas, and the poorly drained soils are on flats or in depressions. Douglas County has a high percentage of nearly level soils. Soil associations 1, 3, and 4 have a low percentage of rolling soils. Association 3 (glacial Lake Douglas) has a high percentage of nearly level soils, which are mostly poorly drained. The strongly sloping soils occur on the morainal ridges and the steeper slopes bordering stream valleys in parts of associations 2, 5, and 6.

Time

Time is necessary for the formation of soil from parent material, but the length of time required is largely dependent on the combined action of the other soil-forming factors. Soils that have little or no soil development are immature, while those that have distinct, well-expressed horizons are mature, even though the parent materials from which they formed are the same age. Parent materials low in lime develop into an acid soil faster than materials high in lime. Permeable soil materials are leached of lime and other soluble minerals faster than fine-textured, slowly permeable materials. Soil development generally is faster under forest vegetation than under prairie vegetation. Also, it is generally faster in a humid climate than in a dry climate.

Soils on a stable landscape generally become more strongly developed or have greater horizon differentiation with increased time of exposure to weathering processes. Most of the soils of Douglas County have moderate horizonation and are moderately developed. Many are leached of lime to a depth of several feet and are acid. In some places the heavy, dark-colored soils, such as those of the Drummer, Pella, Peotone, Milford, Sawmill, and Wabash series, are neutral or only slightly acid. Soils of the Harpster series are calcareous (contain excess lime). Also, soils of the Lawson series generally are not acid. All of the soils have accumulations of organic matter. Those soils that developed under prairie vegetation have a thicker, darker colored surface horizon than those that formed under forest vegetation. In the poorly drained soils, iron compounds have been reduced and have moved downward in the profile, leaving gray, or gleyed, colors in the subsoil. With time, some of the iron has accumulated in concretions or in small, rounded pellets. In the better drained soils, the iron compounds are oxidized, are generally more diffuse, and have imparted a brown or yellowish-brown color to the B horizon.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationships to each other and to the whole environment, and develop principles that will help us to understand their behavior and response to use.

Two systems of classifying soils above the series level are now in general use in the United States. The older system was adopted in 1938 (*2*) and was later revised (*14*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 (*17*). This system is under continual study. Readers interested in the development of the system should refer to available (*13*) literature.

The current system consists of six categories, Beginning with the most inclusive, these categories are

TABLE 7.—*Classification of soil series*

Series	Family [1]	Subgroup	Order
Alvin	Coarse-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Brenton	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol.
Brooklyn	Fine, montmorillonitic, mesic	Mollic Albaqualf	Alfisol.
Camden	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Catlin	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Dana	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Drummer	Fine-silty, mixed, noncalcareous, mesic	Typic Haplaquoll	Mollisol.
Elburn	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol.
Fincastle	Fine-silty, mixed, mesic	Aeric Ochraqualf	Alfisol.
Flanagan	Fine, montmorillonitic, mesic	Aquic Argiudoll	Mollisol.
Harpster	Fine-silty, mixed, mesic	Typic Calciaquoll	Mollisol.
Harvard	Fine-silty, mixed, mesic	Mollic Hapludalf	Alfisol.
Kendall	Fine-silty, mixed, mesic	Aeric Ochraqualf	Alfisol.
Kernan	Fine, montmorillonitic, mesic	Aeric Ochraqualf	Alfisol.
Lawson	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.
Miami	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Milford	Fine, mixed, noncalcareous, mesic	Typic Haplaquoll	Mollisol.
Millbrook	Fine-silty, mixed, mesic	Udollic Ochraqualf	Alfisol.
Montmorenci	Fine-loamy, mixed, mesic	Aquollic Hapludalf	Alfisol.
Nappanee	Fine, illitic, mesic	Aeric Ochraqualf	Alfisol.
Pella	Fine-silty, mixed, noncalcareous, mesic	Typic Haplaquoll	Mollisol.
Peotone	Fine, montmorillonitic, noncalcareous, mesic	Cumulic Haplaquoll	Mollisol.
Plano	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Proctor	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Raub	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol.
Ridgeville	Coarse-loamy, mixed, mesic	Aquic Argiudoll	Mollisol.
Russell	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Rutland	Fine, montmorillonitic, mesic	Aquic Argiudoll	Mollisol.
Sabina	Fine, montmorillonitic, mesic	Aeric Ochraqualf	Alfisol.
St. Charles	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Sawmill	Fine-silty, mixed, noncalcareous, mesic	Cumulic Haplaquoll	Mollisol.
Sexton	Fine, montmorillonitic, mesic	Typic Ochraqualf	Alfisol.
Starks	Fine-silty, mixed, mesic	Aeric Ochraqualf	Alfisol.
Strawn	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Sunbury	Fine, montmorillonitic, mesic	Aquollic Hapludalf	Alfisol.
Toronto	Fine-silty, mixed, mesic	Udollic Ochraqualf	Alfisol.
Wabash	Fine, montmorillonitic, noncalcareous, mesic	Vertic Haplaquoll	Mollisol.
Xenia	Fine-silty, mixed, mesic	Aquic Hapludalf	Alfisol.

[1] Placement of some series in the current system of classification, particularly in families, may change as more precise information becomes available.

the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 7 shows the classification of the soil series of Douglas County according to the current system. The categories of the current system are defined briefly in the following paragraphs.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Two of the ten soil orders are represented in Douglas County: Alfisols and Mollisols.

Alfisols have a clay-enriched B horizon that is high in base saturation but lack a thick, dark-colored surface layer. In Douglas County this order includes soils that formerly were called Gray-Brown Podzolic soils and Planosols. It is represented in this county by soils of the Alvin, Brooklyn, Camden, Fincastle, Harvard, Kendall, Kernan, Miami, Millbrook, Montmorenci, Nappanee, Russell, Sabina, St. Charles, Sexton, Starks, Strawn, Sunbury, Toronto, and Xenia series.

Mollisols generally developed under grass vegetation. They have a thick, dark-colored surface layer called the mollic epipedon. In Douglas County this order includes soils that formerly were called Alluvial soils, Brunizems, and Humic Gleys. It is represented in this county by soils of the Brenton, Catlin, Dana, Drummer, Elburn, Flanagan, Harpster, Lawson, Milford, Pella, Peotone, Plano, Proctor, Raub, Ridgeville, Rutland, Sawmill, and Wabash series.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The soil properties used are mainly those that reflect either the presence or absence of waterlogging, or differences in climate or vegetation. The climatic range of the suborders is narrower than that of the orders.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of similarity in the kinds and sequence of major horizons and soil features. The horizons considered are those in which clay, iron, or humus has accumulated and those that have pans that interfere with the growth of roots or the movement of water. Among the features considered are the self-mulching properties of clays, the soil temperature, and the chemical composition (mainly calcium, magnesium, sodium, and potassium).

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the group, and other groups, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY.—Families are established within each subgroup, primarily on the basis of properties that affect the growth of plants or the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

Laboratory Data

Table 8 gives laboratory data for Milford silty clay loam. A detailed description of the soil profile at the sampling site is given under the Milford series in the section "Descriptions of the Soils." These data are helpful in characterizing and classifying the soil, understanding its genesis, and determining appropriate use and management. Milford silty clay loam is the most extensive nearly level, poorly drained soil in soil association 3, described in the section "General Soil Map." This association occupies an old glacial lakebed in the central part of the county. The clay content of the profile tested is in the lower part of the range for Milford soils in Douglas County.

The data given in the table for particle-size distribution were obtained by the following methods. Sand was separated by wet sieving and the clay by the pipette method (*7, 8*). Chemical analyses were made according to methods described by Peech (*10*). The organic-carbon content was determined by acid-dichromate digestion and ferrous sulfate titration. The cation exchange capacity was determined by direct distillation of adsorbed ammonia. Extractable calcium and magnesium were precipitated from the original extracting solution, calcium as calcium oxalate, magnesium as magnesium ammonium phosphate. Extractable potassium was determined by flame spectrophotometer.

Soils of the Drummer, Flanagan, Harpster, and other soil series have been sampled and analyzed for counties adjacent to Douglas County. These soils are essentially the same as the soils of the same series in Douglas County. These data are on file in the Department of Agronomy, University of Illinois, and at the Illinois State Office of the Soil Conservation Service.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., 401 and 617 pp., illus.

(2) BALDWIN, M., KELLOGG, C. E., and THORP, J.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk. pp. 979–1001.

(3) BUSCH, W. L.
1965. MINERAL PRODUCTION IN ILLINOIS IN 1964. Ill. State Geol. Survey, Cir. 392, 20 pp., illus.

TABLE 8.—*Laboratory data*

[Laboratory tests were conducted at the soil laboratory at the University of Illinois. Dashed lines indicate analysis was not made]

Soil type and location	Horizon	Depth from surface	Particle-size distribution: Sand (2–0.05 mm.)	Particle-size distribution: Silt (0.05–0.002 mm.)	Particle-size distribution: Clay (<0.002 mm.)	Organic carbon [1]	Extractable cations [2]: Ca	Extractable cations [2]: Mg	Extractable cations [2]: K	Cation exchange capacity (NH_4 OAc)	Base saturation (NH_4 OAc)	Reaction
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Meq./100 gm.*	*Meq./100 gm.*	*Meq./100 gm.*	*Percent*	*Percent*	*pH*
Milford silty clay loam, NW¼ NW¼NE¼ sec. 26, T. 15 N., R. 9 E.	Ap	0–7	15.5	48.9	35.6	2.20	21.9	6.3	0.5	30.8	94	6.6
	A1	7–15	15.1	47.1	37.8	1.44	19.8	8.1	.4	30.1	94	6.7
	A3	15–19	13.8	48.1	38.1	.92	17.1	8.8	.4	28.9	91	6.4
	B21g	19–23	13.9	48.1	37.8	.85	17.3	8.8	.4	27.3	98	6.6
	B22g	23–30	14.3	49.9	35.6	.50	16.0	8.4	.3	25.5	97	6.9
	B23g	30–34	14.0	50.0	36.0	.44	17.1	8.3	.3	24.6	105	7.2
	IIB3g	34–43	17.8	49.8	32.4	.34	13.9	7.0	.4	20.7	103	7.5
	IIC1	43–52	17.8	49.7	32.5	.28	---	---	---	---	---	7.7
	IIC2	52–60	22.5	47.4	30.1	.24	---	---	---	---	---	7.6

[1] Organic carbon percentage multiplied by 1.724 equals percentage of organic matter.
[2] One milliequivalent of calcium (Ca) per 100 grams equals 400 pounds per acre, or per 2 million pounds of soil.
One milliequivalent of magnesium (Mg) per 100 grams equals 240 pounds per acre, or per 2 million pounds of soil.
One milliequivalent of potassium (K) per 100 grams equals 780 pounds per acre, or per 2 million pounds of soil.

(4) CLEGG, KENNETH E.
1959. SUBSURFACE GEOLOGY AND COAL RESOURCES OF THE PENNSYLVANIAN SYSTEM IN DOUGLAS, COLES, AND CUMBERLAND COUNTIES, ILLINOIS. Ill. State Geol. Survey, Cir. 271, 16 pp., illus.

(5) FEHRENBACHER, J. B., WHITE, J. L., ULRICH, H. P., and ODELL, R. T.
1965. LOESS DISTRIBUTION IN SOUTHEASTERN ILLINOIS AND SOUTHWESTERN INDIANA. Soil Sci. Soc. of Amer., Proc., v. 29, No. 5, pp. 566–572, illus.

(6) GARDINER, M. J., ODELL, R. T., and HALLBICK, D. C.
1966. POORLY DRAINED SOILS AND GEOMORPHOLOGY OF GLACIAL LAKE DOUGLAS IN ILLINOIS. The Jour. of Geol., May, v. 74, No. 3: 332–344, illus.

(7) KILMER, V. J., and ALEXANDER, L. T.
1949. METHODS OF MAKING MECHANICAL ANALYSES OF SOILS. Soil Sci. 68: 15–24.

(8) ———, and MULLINS, J. F.
1954. IMPROVED STIRRING AND PIPETTING APPARATUS FOR MECHANICAL ANALYSIS OF SOILS. Soil Sci. 77: 437–441, illus.

(9) LEIGHTON, M. M., EKBLAW, GEORGE E., and HORBERG, LELAND.
1948. PHYSIOGRAPHIC DIVISIONS OF ILLINOIS. Ill. State Geol. Survey, Report of Investigations No. 129, 33 pp., illus.

(10) PEECH, M., ALEXANDER, L. T., DEAN, L. A., and REED, J. F.
1947. METHODS OF SOIL ANALYSIS FOR SOIL-FERTILITY INVESTIGATIONS. U.S. Dept. Agr., Cir. 757, 25 pp.

(11) PORTLAND CEMENT ASSOCIATION.
1962. PCA SOIL PRIMER. 52 pp., illus. Chicago.

(12) SELKREGG, LIDIA F., and KEMPTON, JOHN P.
1958. GROUNDWATER GEOLOGY IN EAST-CENTRAL ILLINOIS. Ill. State Geol. Survey, Cir. 248, 36 pp., illus.

(13) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Science, v. 137, No. 3535: 1027–1034, illus.

(14) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUP. Soil Sci. 67: 117–126.

(15) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.

(16) ———
1957. SOIL. U.S. Dept. Agr. Ybk., 784 pp., illus.

(17) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplements issued in March 1967 and September 1968]

(18) WATERWAYS EXPERIMENT STATION, U.S. CORPS OF ENGINEERS.
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3–357, v. 1, illus.

(19) WHITING, LESTER L., VAN DEN BERG, JACOB, et al.
1965. PETROLEUM INDUSTRY IN ILLINOIS, 1964. Ill. State Geol. Survey, Illinois Petroleum, No. 80, 115 pp., illus.

Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of the soil to hold water that can be used by plants. Water held between the wilting point (15 atmospheres of tension) and the field capacity (1/3 atmosphere). In this publication classes of available moisture capacity to a depth of 60 inches are as follows:

Very high	12 inches or more.	Low	3 to 6 inches.
High	9 to 12 inches.	Very low.	Less than 3 inches.
Moderate.	6 to 9 inches.		

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage, soil. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in the Podzolic soils commonly have mottlings below a depth of 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Verly poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Uneroded means that more than 7 inches of the surface layer remains; *eroded* means that 3 to 7 inches of the surface layer remains; *severely eroded* means that less than 3 inches of the surface layer remains.

Green-manure catch crop. A crop that is plowed under while green for its beneficial effect on the soil.

Glacial till. Unassorted, unstratified sediment carried or deposited by glacial ice.

Horizon soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an 0 horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Loess. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about (0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *course,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Outwash, glacial. The material swept out, sorted, and deposited beyond the glacial ice front by streams of melt water.

Permeability, soil. The quality of a soil that enables it to transmit air and water. The following relative classes of soil permeability, used in this soil survey, refer to estimated rates of movement of water in inches per hour:

	Inches per hour		*Inches per hour*
Very slow	Less than 0.06	Moderate	0.63–2.00
Slow	0.06–0.20	Moderately rapid	2.00–6.3
Moderately slow	0.20–0.63	Rapid	6.3–20.0

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Medium acid	5.6 to 6.0
Very strongly acid	4.5 to 5.0	Slightly acid	6.1 to 6.5
Strongly acid	5.1 to 5.5	Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8	Strongly alkaline	8.5 to 9.0
Moderately alkaline	7.0 to 8.4	Very strongly alkaline	9.1 and higher

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

U. S GOVERNMENT PRINTING OFFICE : 1971 O - 383-851

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.