SOIL SURVEY OF

Kankakee County, Illinois

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Illinois Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1969 to 1973. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. 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 Kankakee County, Illinois, Soil and Water Conservation District. The cost was shared by the Kankakee County Board.

Soil maps in this area may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale. This soil survey is Illinois Agricultural Experiment Station Number 105.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All the soils of Kankakee 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. It also shows the page where each soil is described and the tree planting group in which the soil has been placed.

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 general management for crops and pasture and use of the soil for woodland.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Wildlife managers and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the sections "Engineering" and "Recreation."

Engineers and builders can find, under "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 the soils in the section "Formation and Classification of Soils."

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

Cover: Limestone bedrock escarpment along Rock Creek near Kankakee River State Park. Whalan loam has formed on the nearly level area above the escarpment.

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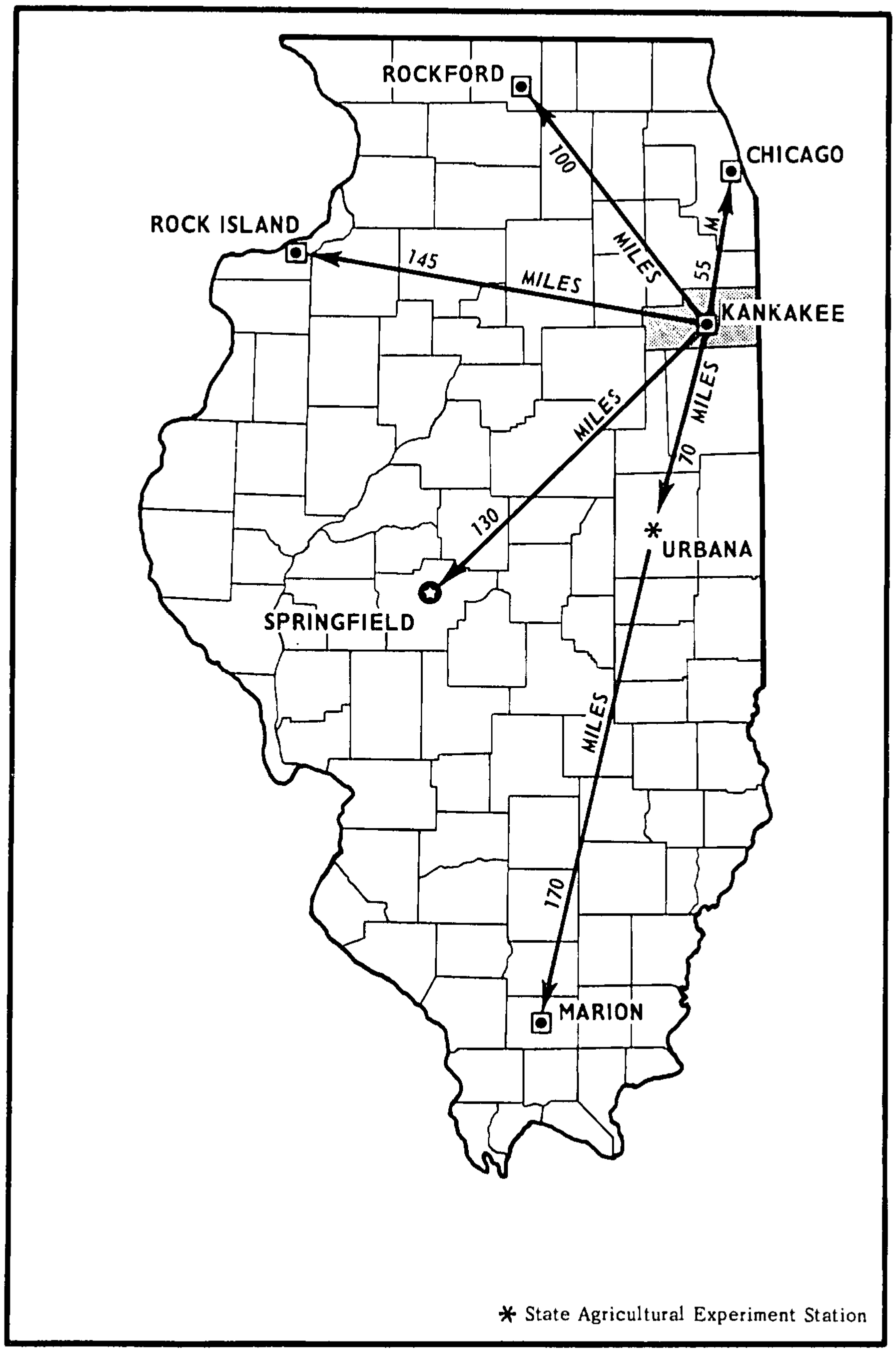

Location of Kankakee County in Illinois.

SOIL SURVEY OF KANKAKEE COUNTY, ILLINOIS

By John E. Paschke

Fieldwork by J. E. Paschke, B. E. Currie, L. M. Reinebach, and D. L. Smith, Soil Conservation Service. Others who helped with the fieldwork are: R. J. Herman, H. R. Sinclair Jr., L. J. Bushue, and D. C. Hallbick

United States Department of Agriculture, Soil Conservation Service, In Cooperation with The University of Illinois Agricultural Experiment Station

KANKAKEE COUNTY is in northeastern Illinois on the eastern border of Indiana. It has an area of about 434,176 acres, or 680 square miles. Kankakee County has 17 political townships. Some geographical townships are measured from the second Prime Meridian and some from the third. More than half the population lives in the city of Kankakee and in nearby communities and towns.

General Nature of the County

This section gives general information about Kankakee County. It discusses briefly settlement, population, transportation, and farming. This section also describes the relief and drainage and the climate of the county.

Settlement and Population

In 1832, the first permanent settlement in what is now Kankakee County was made at Bourbonnais. The county was established in 1853 from parts of Will and Iroquois Counties. It was named from words of Indian origin that are thought to mean "Wonderful Valley."

Since the time of settlement, the population of Kankakee County has increased steadily, and the greatest increase has been in the last 20 years. According to the 1970 Census, about 97,250 people live in the county. Of this, only about 10,332 live on operating farms.

Kankakee County has a well developed system of roads. Federal and State highways cross the county, and Interstate Route 57 runs through the center in a north-south direction. County and township roads, mostly hard surfaced or graveled, serve all sections of the county.

Four main-line railroads and four branch lines serve the county. They were instrumental in the industrial development that has taken place. A commercial airport is located south of Kankakee.

Farming

Farming is the principal industry in Kankakee County. According to the 1970 Conservation Needs Inventory (*5*),[1] about 71 percent of the county is cropland. The percentage in farms, however, is showing a steady decline. Although the number of farms is decreasing, the size of the average farm is increasing. In 1969, according to the U.S. Census of Agriculture, there were 1,500 farms in the county, each averaging 261 acres in size.

Growing cash grain is the main enterprise, but a few livestock and dairy farms are scattered throughout the county. A large part of the acreage is in corn and soybeans. A much smaller part is in such crops as wheat, oats, hay, truck crops, gladioli, and sod grass.

Raising livestock, although still an important enterprise on many farms, has shown a steady decline. The most marked decrease has been in the number of dairy cows.

Physiography, Relief, and Drainage

Kankakee County is in the till plain of the Central Lowland Province. Most of the county is part of the Kankakee Plain, but the southwestern Marseilles Moraine is part of the Bloomington Ridged Plain, and the northeastern morainal area is part of the Wheaton Moraine.

About 94 percent of the county is nearly level to gently sloping. The rest is rolling to steep and is in morainal areas and on some of the prominent sandhills.

The elevation ranges from 750 feet above sea level at Pilot Hill on the Marseilles Moraine to 550 feet where the Kankakee River leaves the county at the Will County line.

The underlying bedrock has been greatly modified by glaciation. Bedrock is at a depth of 0 to 100 feet, except in small areas along the moraines in the northeastern and southwestern corners of the county. Limestone outcrops are common in the Kankakee River Valley and in the glacial torrent area adjacent to it. The torrent area was created when a huge torrential river fed by glacial melt water removed the soil material covering the bedrock and, in addition, piled chunks of loose limestone into islandlike areas of rubble.

[1] Italic numbers in parentheses refer to Literature Cited, p. 81.

Most of Kankakee County is drained by the Kankakee River. A small area along the western side of the county drains into the Mazon River.

Open drainage ditches were needed to bring large acreages of the county under cultivation. Hundreds of miles of drainage ditches have been constructed, and 52 drainage districts and one river conservency district have been organized. Nevertheless, thousands of acres in the county would be more productive if they were more adequately drained. In many areas, urban development has caused the deterioration of the artificial drainage systems that were used when the area was farmed. As a result, individual households are endangered by a high water table that causes flooding, wet basements, inoperative septic tank systems, and even contaminated wells.

Climate[2]

Kankakee County has the continental climate typical of central Illinois. The temperature ranges from the upper 90's to about –10°. Low-pressure areas and the associated weather fronts bring frequent changes in temperature, humidity, cloudiness, and wind direction during much of the year.

Annual precipitation averages 33 inches; it ranged from 22 to 45 inches during the period 1931-68. Table 1 shows the average daily temperature and the average monthly precipitation in the county. Precipitation averages less than 28 inches in about one year in six, and about as frequently averages more than 37 inches. The monthly precipitation averages less than 2 inches during December through February, but is nearly 4 inches in May and June. More than 50 percent of the annual precipitation normally falls during the growing season of May through September.

Normal rainfall in July and August is insufficient to supply the moisture needed by a vigorously growing field crop. Moisture must be stored in the subsoil from fall through spring if a good crop is to be produced. Major droughts are infrequent, but prolonged dry periods during a part of the growing season are fairly common. Such periods generally result in reduced crop yields.

In summer, precipitation occurs mostly as brief showers or thunderstorms. A single thunderstorm produces more than 1 inch of rain and occasionally is accompanied by hail and damaging wind. On July 12 and 13, 1957, 8 to 10 inches of rain fell in less than 24 hours in parts of the county.

Field crops are most likely to be damaged if hail falls in June, July, and August. Thunderstorms occur on an average of about 40 days annually, and about half of these occur during the critical growing period. Thunderstorms that produce hail occur on an average of less than 3 days annually in any particular locality, and only one occurs in 2 years during the summer. Not all hailstorms have enough stones of sufficient size to cause extensive crop damage.

[2] By WILLIAM L. DENMARK, climatologist for Illinois, National Weather Service, U.S. Department of Commerce.

TABLE 1.—*Temperature and precipitation data*

[Data for temperature and rainfall are based on records kept at Kankakee for the period 1931-68]

Month	Average daily temperature	Average total precipitation[1]
	°F	Inches
January	26	1.6
February	28	1.6
March	38	2.3
April	50	3.8
May	61	3.9
June	71	3.9
July	75	3.2
August	73	3.4
September	66	2.7
October	55	2.6
November	41	2.1
December	29	1.8
Year	51	32.7

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

The annual snowfall averages about 22 inches. More than this fell in the single month of January in 1918, however, and nearly 50 inches fell during the winter of 1925-26.

Summers are warm, but hot periods are seldom prolonged. Cool air invades from the north frequently enough, even in summer, to prevent the stagnation of hot, humid air masses. July is normally the warmest month. Temperatures of 100° F or higher occurred in about one-third of the summers since 1931; but only 7 years since 1936 had temperatures that high. In one of those years the temperature reached 101°. An average of 28 days in summer reach a maximum temperature of 90° or higher every year. The highest recorded temperature was 109° on July 14, 1936. On 11 days in that month the temperature was 100° or higher.

January is normally the coldest month. February often has days that are as cold as January, but cold periods are generally shorter. The temperature rarely fails to fall below zero sometime during the winter; it falls below zero on about 8 days each year. Temperatures of –20° or lower have been recorded in all three of the winter months; the lowest since 1931 was –23° on January 23, 1936. Thus, the highest and lowest temperatures during the period occurred in the same year.

The number of days between the average date of the last freezing temperature (32° or below) in spring and the first in fall has been termed the "growing season." The growing season averages 170 days in Kankakee County. Different crops, however, have different temperatures at which growth is affected. Table 2 indicates the probability of several different threshold temperatures (*4, 6*).

Temperatures generally vary considerably between ridges and valleys. They are often much cooler in the valleys than on the ridges during clear, calm nights, and the growing season is shorter.

TABLE 2.—*Probability of freezing temperatures in spring and in fall*[1]

Probability	Dates for given probability and temperature				
	32° F	28° F	24° F	20° F	16° F
Last in spring:					
Average date	April 28	April 13	March 30	March 21	March 10
25 percent chance after	May 7	April 22	April 8	March 30	March 19
10 percent chance after	May 15	April 30	April 16	April 7	March 27
First in fall:					
Average date	October 16	October 29	November 6	November 16	November 26
25 percent chance before	October 7	October 20	October 28	November 7	November 17
10 percent chance before	September 30	October 13	October 21	October 31	November 10

[1] All freeze data are based on temperatures for 1931-60 in a standard U.S. Weather Bureau thermometer shelter at a height of approximately 5 feet above the ground and in a representative exposure. Lower temperatures occur at times nearer the ground in local areas subject to extreme air drainage.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Kankakee County, where they are located, and how they can be used. The 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; the kinds of rock; 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* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have a profile 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. Bonfield and Kankakee, 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 layer 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, Frankfort silt loam, 2 to 6 percent slopes, is one of several phases within the Frankfort 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. The photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the 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.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names, such as "Lena muck," which is a land type in Kankakee County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are 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 soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then 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 the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning of a watershed, a wooded tract, or a wildlife area or for broad planning of recreational facilities, community developments, and such engineering works as transportation corridors. It is not suitable for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey have been grouped into general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in them are described on the following pages.

Nearly Level to Moderately Sloping Soils That Formed in Moderately Fine Textured and Fine Textured Glacial Drift

1. Elliott-Varna-Ashkum association

Deep, moderately slowly permeable, nearly level to moderately sloping soils that formed in moderately fine textured glacial till; on glacial moraines

This association consists of nearly level to gently sloping soils on ground moraines where the elevation varies less than 10 feet and nearly level to moderately sloping soils on terminal moraines where the elevation varies as much as 50 feet.

This association makes up about 21 percent of the county. It is about 33 percent Elliott soils, 16 percent Varna soils, 11 percent Ashkum soils, and 40 percent minor soils (fig. 1).

Elliott soils are on ground moraines. They are nearly level to gently sloping and are somewhat poorly drained. Typically, the surface layer is black silt loam about 14 inches thick. The subsoil is about 27 inches thick. It is dark grayish brown heavy silty clay loam in the upper 4 inches, grayish brown silty clay in the

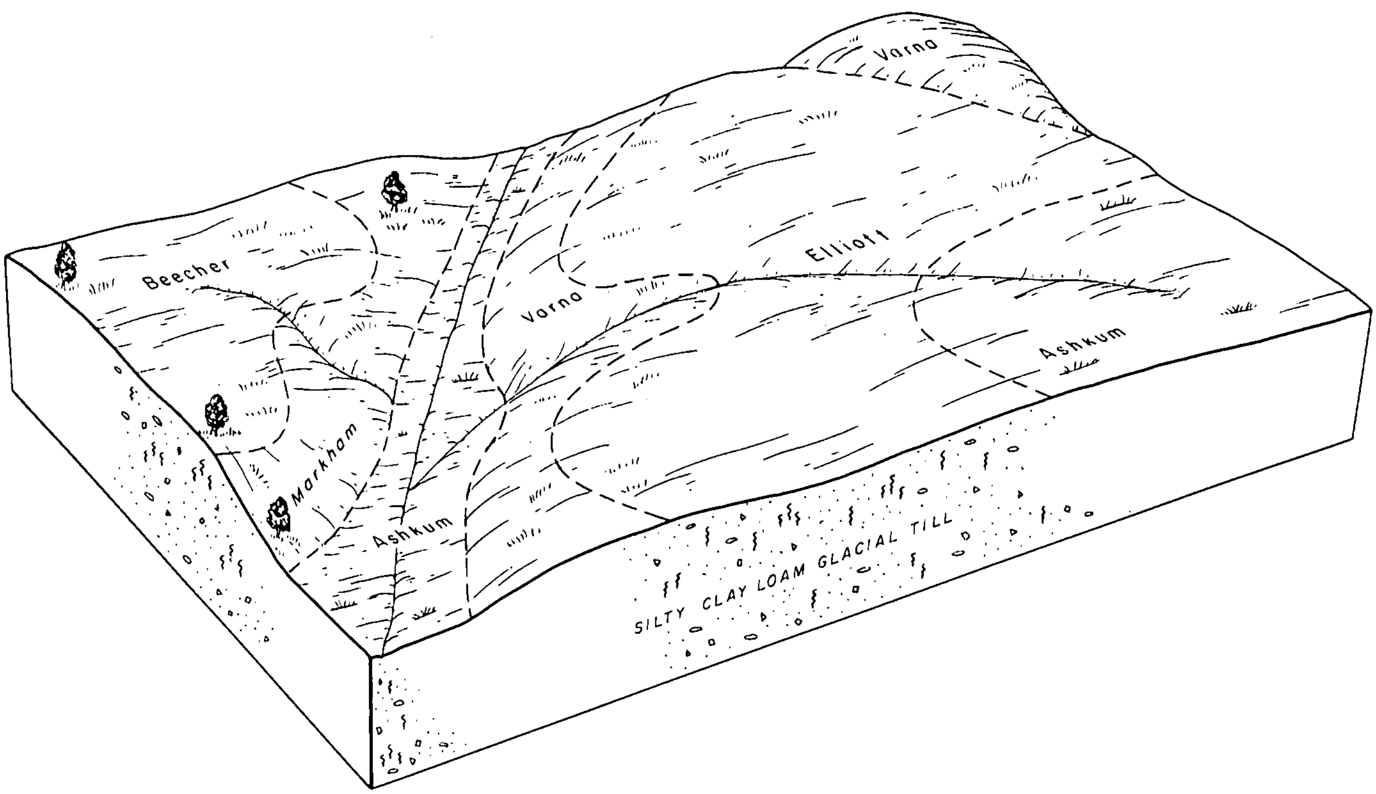

Figure 1.—Typical pattern of soils in Elliott-Varna-Ashkum association.

next 7 inches, and brown silty clay loam in the lower 16 inches. The underlying material is brown silty clay loam till.

Varna soils are on terminal moraines. They are nearly level to moderately sloping and are moderately well drained and well drained. Typically, the surface layer is very dark gray and very dark grayish brown silt loam about 12 inches thick. The subsoil is 36 inches thick. It is brown, dark yellowish brown, and light olive brown silty clay loam and silty clay in the upper 18 inches and grayish brown and gray silty clay loam in the lower 18 inches. The underlying material is calcareous, gray, silty clay loam glacial till.

Ashkum soils are in low-lying areas. They are nearly level and poorly drained. Typically, the surface layer is black silty clay loam about 13 inches thick. The subsoil is mainly mottled gray silty clay loam and is about 33 inches thick. The underlying material is compact, gray, calcareous, silty clay loam glacial till.

Of minor extent in this association are the Markham, Beecher, and Morley soils. Markham and Morley soils are in the more sloping areas on the moraines near Varna soils, and they have similar drainage. Beecher soils are in similar positions on the landscape to Elliott soils.

Most of this association is well suited to and used for corn and soybeans. The main concerns of management are controlling water erosion on the gently sloping to moderately sloping soils and providing adequate drainage on the nearly level soils.

2. *Beecher-Milford association*

Deep, slowly permeable and moderately slowly permeable, nearly level to gently sloping soils that formed in moderately fine textured glacial lake sediment and glacial till; on glacial moraines and lakebeds

This association consists of nearly level to gently sloping soils on ground moraines and glacial lakebeds in broad areas where elevation varies less than 4 feet.

This association makes up about 5 percent of the county. It is about 36 percent Beecher soils, 35 percent Milford soils, and 29 percent minor soils.

Beecher soils are on broad plains. They are nearly level to gently sloping and are somewhat poorly drained. Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is dark grayish brown silty clay loam about 4 inches thick. The subsoil is mainly mottled grayish brown and yellowish brown silty clay loam about 24 inches thick. The underlying material is yellowish brown, calcareous, silty clay loam glacial till.

Milford soils are in low-lying areas. They are nearly level and poorly drained. Typically, the surface layer is black silty clay loam about 16 inches thick. The subsoil is about 31 inches thick. It is mottled very dark grayish brown silty clay loam in the upper part, dark grayish brown and dark gray silty clay in the middle part, and dark gray silty clay loam in the lower part. The underlying material is stratified, gray silty clay loam that has layers of silt loam and fine sandy loam.

Of minor extent in this association are the Ashkum, Martinton, and Markham soils. The poorly drained Ashkum soils are in low-lying areas near Milford soils. Martinton soils are in slightly higher positions on the landscape than Milford soils. Markham soils are in the highest part of the landscape.

This association is used for and well suited to intensive cropping of such cultivated crops as corn and soybeans. The main concern of management is providing proper drainage, which can be done by using tile and surface drains.

3. *Bryce-Mokena-Frankfort association*

Deep, slowly permeable and moderately slowly permeable, nearly level to gently sloping soils that formed in fine textured glacial drift and medium textured glacial outwash; on glacial moraines and lakebeds

This association consists of nearly level soils on glacial lakebeds and nearly level to gently sloping soils on ground moraines.

This association makes up about 2 percent of the county. It is about 36 percent Bryce soils, 27 percent Mokena soils, 22 percent Frankfort soils, and 15 percent minor soils (fig. 2).

Bryce soils are in low-lying areas. They are nearly level and poorly drained. Typically, the surface layer is black silty clay about 11 inches thick. The subsoil is mottled very dark gray, dark gray, and gray silty clay about 29 inches thick. The underlying material is mottled gray silty clay.

Mokena soils are on low ridges. They are nearly level and somewhat poorly drained. Typically, the surface layer is black loam about 15 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown loam in the upper part, brown clay loam in the middle part, and greenish gray silty clay in the lower part. The underlying material is greenish gray silty clay.

Frankfort soils are on low ridges. They are nearly level to gently sloping and are somewhat poorly drained. Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsoil is about 26 inches thick. It is mottled grayish brown silty clay in the upper part and mottled olive brown and gray silty clay in the lower part. The underlying material is compact, gray silty clay glacial till.

Of minor extent in this association are the Milford and Martinton soils. Milford soils are in low-lying areas near Bryce soils. Martinton soils are in slightly elevated areas on ground moraines.

This association is well suited to intensive cropping. The main crops are corn and soybeans. The main concern of management is improving drainage, which can be done by using surface and tile drains that have proper outlets.

Nearly Level to Gently Sloping Soils That Formed in Medium, Moderately Fine, and Moderately Coarse Textured Glacial Drift

4. *Selma-Darroch-Jasper association*

Deep, moderately permeable and moderately slowly permeable, nearly level to gently sloping soils that

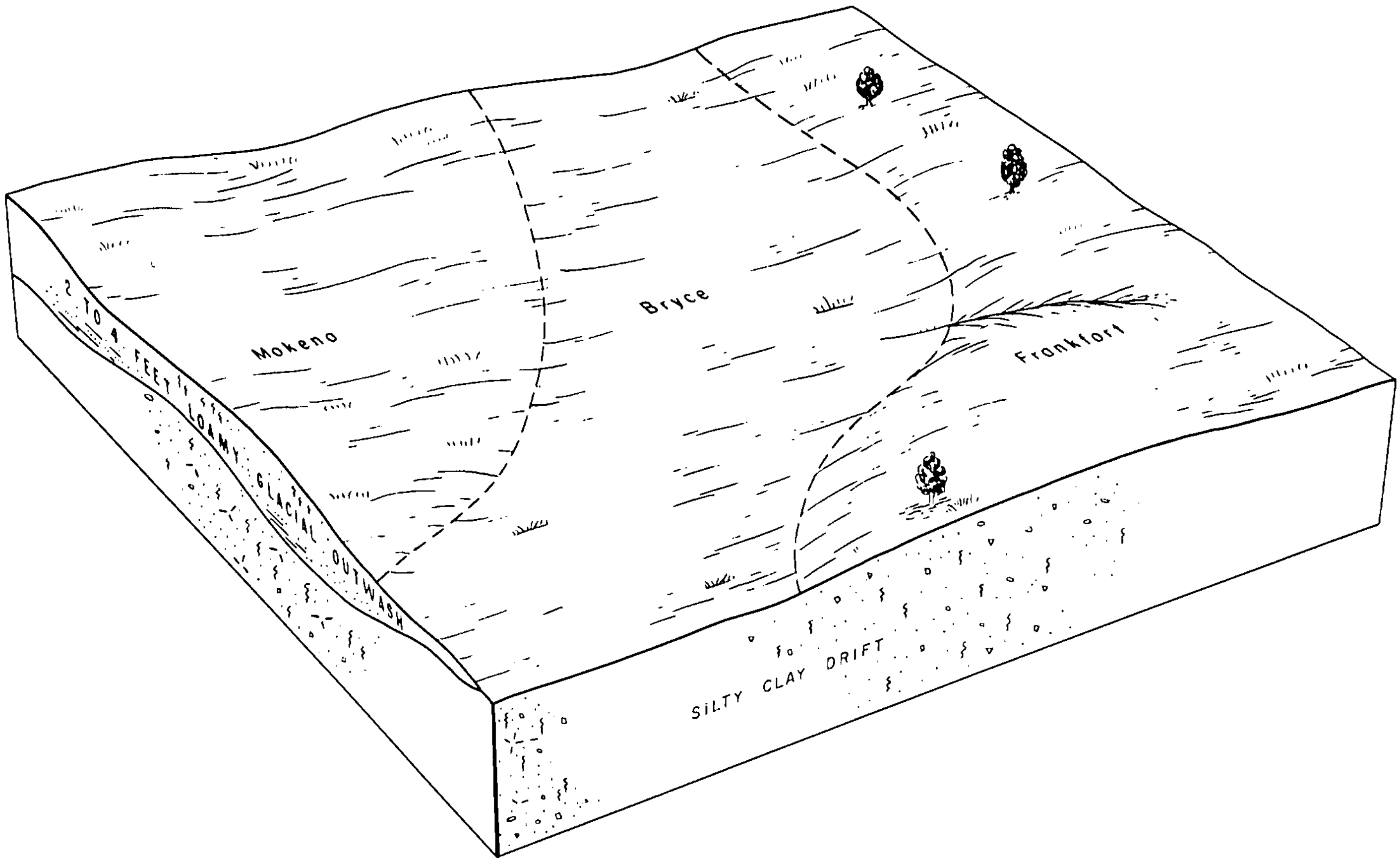

Figure 2.—Typical pattern of soils in Bryce-Mokena-Frankfort association.

formed in medium textured and moderately coarse textured glacial outwash; on uplands

This association consists of nearly level to gently sloping soils on glacial outwash plains that are dissected by tributaries of the Kankakee River.

This association makes up 7 percent of the county. It is about 30 percent Selma soils, 22 percent Darroch soils, 20 percent Jasper soils, and 28 percent minor soils.

Selma soils are nearly level and poorly drained. Typically, the surface layer is black and very dark gray loam about 14 inches thick. The subsoil is about 28 inches thick. It is dark grayish brown clay loam in the upper part, gray clay loam in the middle part, and gray sandy loam in the lower part. The underlying material is light gray and light brownish gray sand.

Darroch soils are in slightly elevated areas on outwash plains. They are nearly level and somewhat poorly drained. Typically, the surface layer is black and very dark grayish brown silt loam about 14 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown silty clay loam in the upper part, brown silty clay loam in the middle part, and grayish brown silty clay loam and loam in the lower part. The underlying material is stratified, grayish brown loam and gravelly sandy loam.

Jasper soils are on the highest part of the landscape. They are nearly level to gently sloping and are well drained. Typically, the surface layer is black and very dark grayish brown silt loam about 15 inches thick. The subsoil is about 30 inches thick. It is dark yellowish brown silt loam in the upper part, dark yellowish brown and brown clay loam in the middle part, and brown loam in the lower part. The underlying material is stratified, dark yellowish brown sandy loam and sand.

Of minor extent in this association are the Beardstown and Gilford soils. Beardstown soils are similar to and adjacent to Darroch soils. The poorly drained Gilford soils are on the lowest part of the landscape next to Selma soils.

This association is well suited to intensive cropping. The main crops are corn and soybeans. The main concern of management is removing excessive water, which can be done by using artificial drainage.

5. *Andres-Reddick-Symerton association*

Deep, moderately permeable, nearly level to gently sloping soils that formed in medium textured and moderately fine textured outwash sediment and glacial till; on uplands

This association consists of nearly level to gently sloping soils on broad ground moraines that have very limited relief.

This association makes up 21 percent of the county. It is about 40 percent Andres soils, 36 percent Reddick soils, 13 percent Symerton soils, and 11 percent minor soils.

Andres soils are nearly level and somewhat poorly drained. Typically, the surface layer is black and very dark brown silt loam about 14 inches thick. The subsoil is about 28 inches thick. It is grayish brown and dark grayish brown clay loam in the upper part and grayish brown silty clay loam in the lower part. The underlying material is grayish brown silty clay loam glacial till (fig. 3).

Reddick soils are nearly level and poorly drained. Typically, the surface layer is black and very dark gray clay loam about 13 inches thick. The subsoil is about 34 inches thick. It is dark gray and gray clay loam in the upper part and light gray silty clay loam in the lower part. The underlying material is light gray silty clay loam glacial till.

Symerton soils are nearly level to gently sloping and are moderately well drained and well drained. Typically, the surface layer is black and very dark grayish brown silt loam about 13 inches thick. The subsoil is about 31 inches thick. It is dark brown and dark yellowish brown silty clay loam in the upper part, yellowish brown clay loam in the middle part, and yellowish brown silty clay loam in the lower part.

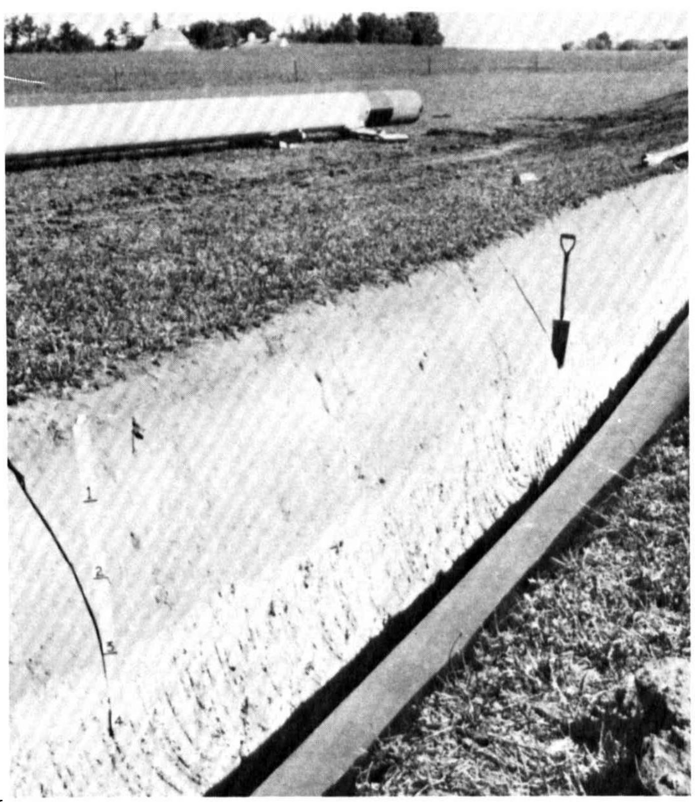

Figure 3.—**Pipeline being installed in silty clay loam glacial till. The soil is Andres silt loam.**

The underlying material is brown silty clay loam glacial till.

Of minor extent in this association are the Elliott and Varna soils. The somewhat poorly drained Elliott soils are adjacent to Andres soils. The moderately well drained Varna soils are near Symerton soils.

This association is well suited to intensive cropping. Corn and soybeans are the main crops. The main concerns of management are providing artificial drainage on Reddick and Andres soils and controlling water erosion on the gently sloping Symerton soils.

Nearly Level to Very Steep Soils That Formed in Coarse Textured and Moderately Coarse Textured Glacial Outwash

6. Oakville-Maumee-Watseka association

Deep, rapidly permeable and very rapidly permeable, nearly level to very steep soils that formed in sandy glacial outwash; on uplands

This association consists mainly of nearly level to very steep soils on broad outwash plains that have prominent sand ridges 10 to 40 feet high.

This association makes up about 12 percent of the county. It is about 30 percent Oakville soils, 26 percent Maumee soils, 19 percent Watseka soils, and 25 percent minor soils.

Oakville soils are on elongated sand ridges. They are nearly level to very steep and are excessively drained. Typically, the surface layer is dark brown fine sand about 7 inches thick. The subsoil is yellowish brown fine sand about 33 inches thick. The underlying material is light yellowish brown and very pale brown fine sand.

Maumee soils are in low-lying or depressional areas. They are nearly level and poorly drained. Typically, the surface layer is black loamy fine sand about 18 inches thick. The subsoil is light brownish gray fine sand about 8 inches thick. The underlying material is gray fine sand.

Watseka soils are nearly level and somewhat poorly drained. Typically, the surface layer is black and very dark gray loamy fine sand about 10 inches thick. The subsoil is fine sand about 22 inches thick. It is dark grayish brown in the upper part and light brownish gray in the lower part. The underlying material is light gray fine sand.

Of minor extent in this association are the Morocco, Sparta, and Chelsea soils. The somewhat poorly drained Morocco soils are near Watseka soils. The excessively drained Sparta and Chelsea soils are on sandy ridges near Oakville soils. Strip mined areas are in some places.

Part of this association is used for cultivated crops. Most of the areas on sandy ridges are in grass or woods. The main concerns of management are providing adequate drainage and controlling soil blowing on the nearly level soils and maintaining a permanent grass or tree cover on the gently sloping to very steep sand ridges.

7. *Gilford-Hoopeston-Ade association*

Deep, moderately rapidly permeable to rapidly permeable, nearly level to gently sloping soils that formed in sandy and loamy glacial outwash; on uplands

This association consists of nearly level to gently sloping soils on broad outwash plains that have low ridges in irregular patterns. The Kankakee and Iroquois Rivers flow through these areas, and they lack distinctive flood plains.

This association makes up about 20 percent of the county. It is about 39 percent Gilford soils, 20 percent Hoopeston soils, 15 percent Ade soils, and 26 percent minor soils.

Gilford soils are nearly level and very poorly drained. Typically, the surface layer is black and very dark gray fine sandy loam about 16 inches thick. The subsoil is about 21 inches thick. It is gray sandy clay loam in the upper part, gray fine sandy loam in the middle part, and gray loamy fine sand in the lower part. The underlying material is gray loamy fine sand.

Hoopeston soils are nearly level and somewhat poorly drained. Typically the surface layer is black and very dark gray fine sandy loam about 13 inches thick. The subsoil is about 33 inches thick. In the upper 20 inches it is dark grayish brown and grayish brown fine sandy loam; and in the lower 13 inches it is grayish brown, stratified fine sandy loam, loamy fine sand, and silt loam. The underlying material is stratified gray loamy fine sand, fine sandy loam, and silt loam.

Ade soils are nearly level to gently sloping and are somewhat excessively drained. Typically, the surface layer is black and very dark grayish brown loamy fine sand about 14 inches thick. The subsurface layer is dark yellowish brown and yellowish brown fine sand about 27 inches thick. The subsoil consists of bands of dark yellowish brown and yellowish brown loamy fine sand separated by thin layers of brownish yellow fine sand. It is about 21 inches thick. The underlying material is light brownish gray fine sand.

Of minor extent in this association are the Chelsea, Maumee, and Selma soils. The excessively drained Chelsea soils are on low ridges near Ade soils. The nearly level Maumee and Selma soils are in low-lying areas.

Most of this association is cultivated. Corn and soybeans are the main crops. The main concerns of management are controlling soil blowing on all soils and providing adequate drainage on the nearly level soils.

8. *Bonfield-Kankakee association*

Deep, moderately rapidly permeable, nearly level to gently sloping soils that formed in moderately coarse textured glacial outwash over cobbly material; on uplands

This association consists of nearly level to gently sloping soils on broad outwash plains that have low ridges in irregular patterns.

This association makes up about 3 percent of the county. It is about 39 percent Bonfield soils, 31 percent Kankakee soils, and 30 percent minor soils.

Bonfield soils are nearly level and somewhat poorly drained. Typically, the surface layer is black loam and very dark brown fine sandy loam about 14 inches thick. The subsoil is about 12 inches thick. It is yellowish brown fine sandy loam in the upper part and yellowish brown very cobbly fine sandy loam in the lower part. The underlying material is very pale brown and brownish yellow very cobbly fine sandy loam.

Kankakee soils are nearly level to gently sloping and are moderately well drained and well drained. Typically, the surface layer is very dark gray fine sandy loam about 9 inches thick. The subsoil is about 18 inches thick. It is brown and yellowish brown fine sandy loam and sandy clay loam in the upper part and brownish yellow very cobbly loam in the lower part. The underlying material is brownish yellow and very pale brown very cobbly fine sandy loam.

Of minor extent in this association are the Fieldon and Gilford soils. They are poorly drained and are on the lowest part of the landscape.

Most of this association is cultivated. It is suited to this use if it is protected from soil blowing and if artificial drainage is provided on the somewhat poorly drained and poorly drained soils. In places cobbles on the surface hinder tillage.

Nearly Level to Gently Sloping Soils That Formed in Moderately Coarse Textured and Medium Textured Outwash Material Over Limestone Bedrock

9. *Rockton-Plattville-Selma, bedrock substratum association*

Deep and moderately deep, moderately permeable, nearly level to gently sloping soils that formed in glacial outwash over limestone bedrock; on uplands

This association consists of nearly level to gently sloping soils on broad outwash plains.

This association makes up about 9 percent of the county. It is about 31 percent Rockton soils, 21 percent Plattville soils, 20 percent Selma bedrock substratum soils, and 28 percent minor soils.

Rockton soils are nearly level to gently sloping and are well drained. Typically, the surface layer is very dark brown and very dark grayish brown loam about 13 inches thick. The subsoil is clay loam about 17 inches thick. It is dark yellowish brown in the upper part and light olive brown in the lower part. Limestone bedrock is at a depth of 30 inches.

Plattville soils are nearly level to gently sloping and are moderately well drained and well drained. Typically, the surface layer is about 14 inches thick. It is very dark gray silt loam in the upper part and very dark grayish brown loam in the lower part. The subsoil is about 30 inches thick. It is dark yellowish brown loam in the upper part and dark brown and dark yellowish brown clay loam in the lower part. Limestone bedrock is at a depth of 44 inches.

Selma, bedrock substratum soils are nearly level and poorly drained. Typically, the surface layer is black and very dark gray loam about 14 inches thick. The subsoil is about 28 inches thick. It is dark grayish brown clay loam in the upper part, gray clay loam in the middle part, and gray sandy loam in the lower part. The underlying material is light gray and light brownish gray sand. Limestone bedrock is at a depth of 40 to 60 inches.

Of minor extent in this association are the Ritchey, Whalan, and Faxon soils. The well drained, shallow Ritchey soils and moderately deep Whalan soils are on the higher parts of the landscape. The poorly drained, moderately deep Faxon soils are in low-lying areas near Selma, bedrock substratum, soils. Limestone quarries are in this association.

The deep and moderately deep soils are mainly cultivated and are planted to corn and soybeans. Most of the shallow Ritchey soils are in grass or urban uses. The main concerns of management are protecting the gently sloping soils from water erosion and providing drainage on the poorly drained soils.

Descriptions of the Soils

The kinds of soil (mapping units) shown on the detailed soil maps at the back of this publication are described in this section. These descriptions, together with the soil maps, can be useful in determining the potential of soil and in managing it for food and fiber production, in planning land use and developing soil resources, and in enhancing, protecting, and preserving the environment. More detailed information for each soil is given in the section "Use and Management of the Soils."

Preceding the name of each mapping unit is the symbol that identifies the unit on the detailed soil map. Each mapping unit description includes general facts about the soil and a brief description of the soil profile. The potential of the soil for various major land uses is estimated. The principal hazards and limitations are indicated, and the management concerns and practices for the major uses are discussed.

A mapping unit represents an area on the landscape and consists of a dominant soil or soils for which the unit is named. Most mapping units have one dominant soil, but some have two or more dominant soils. A mapping unit commonly includes small, scattered areas of other soils. The properties of some included soils can differ substantially from those of the dominant soil or soils and thus greatly influence the use of the dominant soil. How the included soils may affect the use and management of the mapping unit is discussed.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the management group in which the mapping unit has been placed. The page where each management group is described is listed in the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 3. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*9*).

Ade Series

The Ade series consists of nearly level to gently sloping, somewhat excessively drained soils on mounds or elongated, narrow, sandbarlike ridges that make up the higher parts of the landscape. These soils formed in sandy glacial outwash and wind-reworked material. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark grayish brown loamy fine sand about 14 inches thick. The subsurface layer is dark yellowish brown and yellowish brown fine sand about 27 inches thick. The subsoil, to a depth of about 62 inches, is made up of bands of dark yellowish brown and yellowish brown loamy fine sand separated by thin layers of brownish yellow fine sand. The underlying material is light brownish gray fine sand.

Permeability is rapid, and the available water capacity is low. The organic-matter content is moderately low.

Ade soils are used intensively for corn and soybeans. They are subject to severe soil blowing. For the highest productivity, these soils should be protected from soil blowing.

Representative profile of Ade loamy fine sand, 1 to 5 percent slopes, 518 feet west and 35 feet south of the center of sec. 24, T. 30 N., R. 14 W.

A1—0 to 6 inches; black (10YR 2/1) loamy fine sand; weak fine granular structure; friable; neutral; clear smooth boundary.

A12—6 to 14 inches; very dark grayish brown (10YR 3/2) loamy fine sand; weak medium granular structure; loose; continuous very dark gray (10YR 3/1) coatings on ped faces; neutral; clear smooth boundary.

A21—14 to 23 inches; dark yellowish brown (10YR 4/4) fine sand; single grained; loose; discontinuous very dark grayish brown (10YR 3/2) coatings on ped faces; medium acid; clear smooth boundary.

A22—23 to 41 inches; yellowish brown (10YR 5/6) fine sand; single grained; loose; strongly acid; abrupt smooth boundary

B&A23—41 to 52 inches; yellowish brown (10YR 5/8) fine sandy loam (B2t); weak coarse subangular blocky structure; friable; 1 to 2 inch thick lamellae make up 7 inches of horizon; brownish yellow (10YR 6/6) fine sand (A2); single grained; loose; strongly acid; clear smooth boundary.

B&A24—52 to 62 inches; dark brown (7.5YR 4/4) loamy fine sand (B2t); many distinct light brownish gray (10YR 6/2) mottles and strata of fine sand (A2); weak coarse subangular blocky structure; friable; very dark gray (10YR 3/1) root channels; medium acid; clear smooth boundary.

C—62 to 66 inches; light brownish gray (2.5Y 6/2) fine sand; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; single grained; slightly acid.

The A1 horizon ranges from 10 to 18 inches in thickness. It is black and very dark grayish brown loamy fine sand and fine sandy loam. The B&A horizon ranges from 3 to 10 feet or more in thickness. The C horizon is yellow or gray fine sand.

Ade soils are associated with Chelsea, Hoopeston, and Gilford soils. Ade soils are better drained and are at a higher elevation than Hoopeston and Gilford soils. They have a darker colored A1 horizon than Chelsea soils.

98B—Ade loamy fine sand, 1 to 5 percent slopes.

TABLE 3.—*Acreage and proportionate extent of the soils*

Map symbol	Soil name	Acres	Percent
49	Watseka loamy fine sand	9,330	2.1
69	Milford silty clay loam	14,558	3.4
88B	Sparta loamy fine sand, 1 to 5 percent slopes	3,762	0.9
89	Maumee loamy fine sand	12,581	2.9
98B	Ade loamy fine sand, 1 to 5 percent slopes	15,713	3.6
100	Palms muck	1,105	0.3
107	Sawmill silty clay loam	4,783	1.1
125	Selma loam	16,364	3.8
R125	Selma loam, bedrock substratum	8,444	1.9
131B	Alvin fine sandy loam, 1 to 4 percent slopes	1,444	0.3
131C2	Alvin fine sandy loam, 4 to 10 percent slopes, eroded	825	0.2
131F	Alvin fine sandy loam, 12 to 30 percent slopes	321	0.1
146A	Elliott silt loam, 0 to 2 percent slopes	15,223	3.5
146B	Elliott silt loam, 2 to 4 percent slopes	10,047	2.3
150A	Onarga fine sandy loam, 0 to 2 percent slopes	1,285	0.3
150B	Onarga fine sandy loam, 2 to 4 percent slopes	1,286	0.3
172	Hoopeston fine sandy loam	20,980	4.8
188	Beardstown silt loam	5,160	1.2
189	Martinton silt loam	1,916	0.4
194B	Morley silt loam, 2 to 4 percent slopes	862	0.2
194C	Morley silt loam, 4 to 10 percent slopes	311	0.1
194E2	Morley silt loam, 12 to 25 percent slopes, eroded	1,775	0.4
194C3	Morley soils, 5 to 12 percent slopes, severely eroded	1,032	0.2
201	Gilford fine sandy loam	34,568	8.0
W201	Gilford fine sandy loam, wet	2,971	0.7
210	Lena muck	602	0.1
223B	Varna silt loam, 1 to 4 percent slopes	8,850	2.0
223C3	Varna soils, 4 to 7 percent slopes, severely eroded	3,315	0.8
232	Ashkum silty clay loam	12,953	3.0
235	Bryce silty clay	2,491	0.6
240A	Plattville silt loam, 0 to 2 percent slopes	8,057	1.9
240B	Plattville silt loam, 2 to 4 percent slopes	433	0.1
293	Andres silt loam	41,153	9.5
294A	Symerton silt loam, 0 to 2 percent slopes	6,601	1.5
294B	Symerton silt loam, 2 to 4 percent slopes	11,957	2.8
295	Mokena loam	1,473	0.3
298A	Beecher silt loam, 0 to 2 percent slopes	10,785	2.5
298B	Beecher silt loam, 2 to 4 percent slopes	3,331	0.8
311B	Ritchey silt loam, 2 to 6 percent slopes	754	0.2
311D	Ritchey silt loam, 10 to 15 percent slopes	924	0.2
315A	Channahon silt loam, 0 to 2 percent slopes	1,176	0.3
315B	Channahon silt loam, 2 to 4 percent slopes	631	0.2
320A	Frankfort silt loam, 0 to 2 percent slopes	802	0.2
320B	Frankfort silt loam, 2 to 6 percent slopes	593	0.1
330	Peotone silty clay loam	1,637	0.4
380	Fieldon loam	3,971	0.9
440A	Jasper silt loam, 0 to 2 percent slopes	3,513	0.8
440B	Jasper silt loam, 2 to 4 percent slopes	2,240	0.5
493	Bonfield loam	6,110	1.4
494A	Kankakee fine sandy loam, 0 to 2 percent slopes	3,199	0.7
494B	Kankakee fine sandy loam, 2 to 4 percent slopes	1,244	0.3
501	Morocco fine sand	4,321	1.0
503A	Rockton loam, 0 to 2 percent slopes	10,045	2.3
503B	Rockton loam, 2 to 4 percent slopes	1,789	0.4
509A	Whalan loam, 0 to 2 percent slopes	600	0.1
509B	Whalan loam, 2 to 4 percent slopes	902	0.2
516	Faxon clay loam	4,968	1.1
531B	Markham silt loam, 1 to 4 percent slopes	5,163	1.2
531C2	Markham silt loam, 4 to 7 percent slopes, eroded	2,285	0.5
531C3	Markham soils, 4 to 7 percent slopes, severely eroded	1,815	0.4
594	Reddick clay loam	38,111	8.8
740	Darroch silt loam	7,529	1.7
741B	Oakville fine sand, 1 to 6 percent slopes	11,083	2.6
741D	Oakville fine sand, 7 to 18 percent slopes	2,649	0.6
741F	Oakville fine sand, 18 to 40 percent slopes	394	0.1
776	Comfrey soils	2,585	0.6
779B	Chelsea fine sand, 1 to 6 percent slopes	6,183	1.4
	Cut and fill	3,095	0.7
	Made land (sanitary land fill)	105	([1])
	Quarries	921	0.2
	Strip mines	2,056	0.5
	Water	2,136	0.5
	Total	434,176	100.0

[1] Less than 0.1 percent.

This is a nearly level to gently sloping soil on mounds or elongated ridges that are higher than the surrounding, more poorly drained soils.

Included with this soil in mapping are small areas of Onarga fine sandy loam, 0 to 2 percent slopes, small areas of Hoopeston fine sandy loam, and areas where the surface layer is thinner and lighter colored than is described as the range of the series. Also included are areas where the subsoil development or the bands vary in color and thickness from the representative profile.

This soil is suited to the crops commonly grown in the county, but corn and soybeans show a marked reduction in yield because of poor rain distribution or severe soil blowing. Conservation tillage and the use of windbreaks or windstrips of alternate crops are good management practices. Crop rotations that increase the organic-matter content should be used. Management group IIIs-1.

Alvin Series

The Alvin series consists of gently sloping to steep, moderately well drained to well drained soils in high-lying areas or on steep side slopes of the major drainageways. These soils formed in loamy to sandy glacial outwash material. The native vegetation was hardwood trees.

In a representative profile the surface and subsurface layers are dark brown fine sandy loam about 12 inches thick. The subsoil is about 32 inches thick. In sequence from the top it is 16 inches of dark brown fine sandy loam, 3 inches of yellowish brown clay loam, 3 inches of dark brown fine sandy loam, and 10 inches of dark brown loamy fine sand. The underlying material is strong brown fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. The organic-matter content is moderately low.

Alvin soils are in small areas of mainly hardwood trees and permanent pasture. Gently sloping and moderately sloping areas can be farmed intensively if good management practices are used. These practices should increase the organic-matter content and control soil blowing and erosion.

Representative profile of Alvin fine sandy loam, 1 to 4 percent slopes, 990 feet east and 594 feet north of the center of sec. 4, T. 31 N., R. 14 E.

A1—0 to 6 inches; dark brown (10YR 4/3) fine sandy loam; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

A2—6 to 12 inches; dark brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; dark grayish brown (10YR 4/2) staining; medium acid; clear smooth boundary.

B21t—12 to 28 inches; dark brown (7.5YR 4/4) fine sandy loam; moderate fine and medium subangular blocky structure; firm; strongly acid; clear smooth boundary.

B22t—28 to 31 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; very strongly acid; clear smooth boundary.

B23t—31 to 34 inches; dark brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; firm; strongly acid; clear smooth boundary.

B3—34 to 44 inches; dark brown (7.5YR 4/4) loamy fine sand; weak coarse subangular blocky structure; friable; medium acid; clear smooth boundary.

C—44 to 64 inches; strong brown (7.5YR 5/6) fine sand; single grained; loose; slightly acid.

The A horizon ranges from 5 to 14 inches in thickness. The B horizon is mostly fine sandy loam but in places has strata of sandy clay loam and clay loam. The C horizon is mostly stratified fine sand or loamy fine sand but in places is heavier textured material that is part of the stratified outwash material.

Alvin soils are associated with Onarga soils on gently sloping landscapes and with Morley and Markham soils in rolling to steep areas. Alvin soils have a lighter colored A horizon than Onarga soils. They are much coarser textured throughout the profile than Morley and Markham soils.

131B—Alvin fine sandy loam, 1 to 4 percent slopes. This is a nearly level to gently sloping soil on small ridges or in the better drained areas of the very irregular landscape. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Chelsea fine sand, 1 to 6 percent slopes. Also included are small areas where moderately fine textured glacial drift is 4 to 5 feet below the surface.

This soil is well suited to all crops commonly grown in the county but is somewhat droughty during some growing seasons. Many areas are small and are intermingled with soils that are not so well adapted to crops. If this soil is used for crops, the management practices needed are those that increase the organic-matter content and control soil blowing and erosion. Management group IIs-1.

131C2—Alvin fine sandy loam, 4 to 10 percent slopes, eroded. This is a moderately sloping to strongly sloping soil on narrow ridges or short side slopes of drainageways. It has a profile similar to the one described as representative of the series, but the surface layer is thinner. In most cultivated areas, material from the subsoil has been mixed with the surface layer.

Included with this soil in mapping are small areas of severely eroded soils and soils that have slopes of more than 10 percent.

This soil is better suited to pasture and woodland than to cultivated crops, and areas in pasture or woodland should be left in that use. Only a small acreage is used for crops. If cultivated, this soil is subject to droughtiness and erosion. The management practices needed are those that control erosion. Management group IIIs-1.

131F—Alvin fine sandy loam, 12 to 30 percent slopes. This is a moderately steep and steep soil along the Kankakee River Valley.

Included with this soil in mapping are small areas where slopes are less than 12 percent and small areas of Morley silt loam, 12 to 25 percent slopes, eroded.

This soil is best suited to woodland and pasture. Steep slopes are a severe limitation for most uses. Erosion is a serious problem. Management group VIIs-1.

Andres Series

The Andres series consists of nearly level, somewhat poorly drained soils in areas that vary in size and shape. These soils formed in medium textured glacial outwash material and the underlying glacial till. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark brown silt loam about 14 inches thick. The subsoil is 28 inches thick. In the upper 19 inches it is mottled grayish brown and dark grayish brown clay loam, and in the lower 9 inches it is grayish brown silty clay loam that has yellowish brown mottles. The underlying material is grayish brown, compact silty clay loam glacial till that has yellowish brown mottles.

Permeability is moderate, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Andres soils are very well suited to these and other commonly grown crops.

Representative profile of Andres silt loam, 73 feet south and 957 feet west of the northeast corner of sec. 30, T. 30 N., R. 9 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 14 inches; very dark brown (10YR 2/2) silt loam; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

B21t—14 to 20 inches; dark grayish brown (10YR 4/2) clay loam; common fine distinct yellowish brown (10YR 4/2) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; very dark brown (10YR 2/2) coatings on ped faces; slightly acid; clear smooth boundary.

B22t—20 to 30 inches; dark grayish brown (2.5Y 4/2) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; very dark grayish brown (10YR 3/2) coatings on ped faces; slightly acid; gradual smooth boundary.

B23t—30 to 33 inches; grayish brown (2.5Y 5/2) heavy clay loam; common coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; slightly effervescent; moderately alkaline; clear smooth boundary.

IIB3—33 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; strongly effervescent; moderately alkaline; clear wavy boundary.

IIC—42 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse subangular blocky structure parting to massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 16 inches in thickness. It is black, very dark brown, or very dark gray loam or silt loam. The B horizon is dominantly clay loam but includes sandy clay loam and silty clay loam. In many places a layer of loam or sandy loam is between the upper and lower parts of the B horizon. The IIB3 horizon in the underlying glacial till is silty clay loam and has colors similar to the underlying till. The glacial till is also silty clay loam and is compact and calcareous.

Andres soils are in the same position on the landscape as Reddick and Symerton soils. Andres soils are better drained than Reddick soils and more poorly drained than Symerton soils.

293—Andres silt loam. This is a nearly level soil in irregularly shaped areas that are somewhat higher than the flat surrounding areas. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Reddick clay loam and Symerton silt loam, 0 to 2 percent slopes. Also included are small areas where the surface layer and subsoil are coarser textured or finer textured than is described as the range of the series.

This soil is very well suited to the crops commonly grown in the county. It can be cropped intensively. In some years artificial drainage increases crop yields, especially for crops that are planted early in spring. Management group I-1.

Ashkum Series

The Ashkum series consists of nearly level, poorly drained soils in low-lying areas on moraines. These soils formed in silty clay loam glacial till. The native vegetation was prairie grasses adapted to swampy conditions.

In a representative profile the surface layer is black silty clay loam about 13 inches thick. The subsoil is about 33 inches thick. In the upper 4 inches it is dark gray silty clay loam that has black coatings, and in the lower 29 inches it is gray silty clay loam that has yellowish brown mottles and common till pebbles. The underlying material is gray, compact, calcareous silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is high.

Most areas of Ashkum soils are used intensively for corn and soybeans. Ashkum soils are also well suited to the other commonly grown crops.

Representative profile of Ashkum silty clay loam, 24 feet west and 2,628 feet north of the southeast corner of sec. 5, T. 32 N., R. 13 E.

Ap—0 to 9 inches; black (N 2/0) silty clay loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 13 inches; black (10YR 2/1) silty clay loam; moderate medium granular structure; friable; neutral; clear smooth boundary.

B1g—13 to 17 inches; dark gray (10YR 4/1) silty clay loam; few fine faint olive brown (2.5Y 4/4) mottles; moderate very fine subangular blocky structure; firm; black (10YR 2/1) coatings on ped faces; neutral; clear smooth boundary.

B2g—17 to 34 inches; gray (5Y 5/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark gray (10YR 4/1) coatings on ped faces; neutral; clear smooth boundary.

B3g—34 to 46 inches; gray (5Y 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; discontinuous dark gray (10YR 4/1) coatings on ped faces; slightly effervescent; mildly alkaline; gradual smooth boundary.

C—46 to 60 inches; gray (5Y 5/1) silty clay loam; common fine distinct yellowish brown (10YD 5/6) mottles; weak coarse prismatic structure parting to massive; firm; strongly effervescent; moderately alkaline.

The solum ranges from 36 to 60 inches in thickness. The content of stones and pebbles in the profile is variable. The A horizon ranges from 12 to 18 inches in thickness. The B2 horizon is silty clay loam or silty clay, and the heaviest textured material is in the upper part. This horizon ranges from dark grayish brown to gray and has variable yellowish brown and grayish brown mottles. The C horizon is calcareous, compact silty clay loam glacial till.

Ashkum soils are associated with Elliott, Varna, Beecher, Markham, and Morley soils. Ashkum soils are more poorly drained and have more clay in the A horizon than these soils. They have less clay throughout the profile than the poorly drained Bryce soils. Ashkum soils are similar in texture to Milford soils, but Milford soils formed in moderately fine textured lakebed sediment and are stratified in the lower part of the B horizon and in the C horizon.

232—Ashkum silty clay loam. This is a nearly level soil in irregularly shaped, low-lying areas.

Included with this soil in mapping are small areas of Milford silty clay loam and Elliott silt loam, 0 to 2 percent slopes. Also included are small areas of overwash, areas where the underlying material is clay loam till, and areas where the surface layer is thinner than is described as the range of the series. Wet areas, calcareous areas, and gray spots are shown on the soil map by conventional symbols.

This soil is well suited to the crops commonly grown in the county. A seasonal high water table and the moderately slow permeability can be limitations to use. Many areas need additional artificial drainage for cultivation early in spring. Tile drains or shallow surface ditches can be used to improve drainage. Management group IIw-2.

Beardstown Series

The Beardstown series consists of nearly level, somewhat poorly drained soils. These soils formed in loamy and sandy glacial outwash material. The native vegetation was prairie grasses adapted to wet conditions.

In a representative profile the surface layer is about 8 inches thick. It is very dark grayish brown silt loam that has a high sand content. The subsurface layer is about 6 inches thick. It is grayish brown silt loam that has a high sand content. The subsoil is 36 inches thick. In sequence from the top it is 10 inches of grayish brown silty clay loam that has yellowish brown mottles, 4 inches of light brownish gray loam that has yellowish brown mottles, and 22 inches of light brownish gray loamy fine sand. The underlying material is light brownish gray fine sand glacial outwash.

Permeability and the available water capacity are moderate. The organic-matter content is moderate.

Beardstown soils are used intensively for corn and soybeans. Management is needed to conserve moisture, increase the organic-matter content, and regulate fertility.

Representative profile of Beardstown silt loam, 54 feet north and 250 west of the southeast corner of sec. 12, T. 31 N., R. 12 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam that has a high sand content; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 14 inches; grayish brown (10YR 5/2) silt loam that has a high sand content; weak medium platy structure parting to weak fine granular; friable; strongly acid; clear smooth boundary.

B21t—14 to 24 inches; grayish brown (2.5Y 5/2) silty clay loam that has a high sand content; many medium prominent yellowish brown (10YR 5/6) mottles in more than 40 percent of the material; weak and moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (2.5Y 4/2) coatings along root channels; strongly acid; clear smooth boundary.

IIB22t—24 to 28 inches; light brownish gray (2.5Y 6/2) loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky structure; friable; very strongly acid; clear smooth boundary.

IIB3—28 to 50 inches; light brownish gray (2.5Y 6/2) loamy fine sand; many medium prominent yellowish red (5YR 5/6) mottles and many coarse prominent strong brown (7.5YR 5/6) mottles in the lower part; weak medium and coarse subangular blocky structure parting to single grained; loose; medium acid, slightly acid in lower 18 inches; gradual wavy boundary.

IIC—50 to 60 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; neutral.

The A horizon ranges from 10 to 16 inches in thickness. It is silt loam and loam. The A1 or Ap horizon is black and very dark grayish brown, and the A2 horizon is dark grayish brown and grayish brown. The upper part of the B horizon is mottled, variable grayish brown to gray. The B horizon is commonly silty clay loam but in places is sandy clay loam and loam. The C horizon is stratified sand and sandy loam of glacial outwash origin.

The Beardstown soils in Kankakee County are sandier in the lower part of the B horizon than is defined as the range of the series, but this difference does not affect the use or management of the soils.

Beardstown soils are associated with Darroch and Selma soils. Beardstown soils are better drained than Selma soils and have a lighter colored A horizon than Darroch soils.

188—Beardstown silt loam. This is a nearly level soil on outwash plains. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Selma loam or Darroch silt loam. Also included are areas where the soil is coarser textured than is described as representative of the series.

This soil is suited to corn, soybeans, and other crops commonly grown in the county. Droughtiness, a seasonal high water table, and the somewhat low natural fertility are limitations to use. Many areas need additional drainage for cultivation early in spring. Drainage should be provided as needed by tiles or open ditches. Management group IIs-2.

Beecher Series

The Beecher series consists of nearly level to gently sloping, somewhat poorly drained soils in the somewhat higher positions on broad plains north and east of Kankakee. These soils formed in thin silty deposits and the underlying glacial till. The native vegetation was mixed grasses and trees.

In a representative profile the surface layer is very dark gray heavy silt loam about 9 inches thick. The subsurface layer is dark grayish brown silty clay loam about 4 inches thick. The subsoil is about 24 inches thick. In sequence from the top it is 3 inches of mottled brown silty clay loam, 11 inches of mottled grayish brown silty clay loam, and 10 inches of yellowish brown silty clay loam that has gray mottles. The underlying material is yellowish brown, calcareous silty clay loam glacial till that has greenish gray mottles.

Permeability is slow, and the available water capacity is moderate. The organic-matter content is moderate.

Most areas of Beecher soils are used intensively for corn and soybeans. Beecher soils are also suited to the other commonly grown crops.

Representative profile of Beecher silt loam, 0 to 2 percent slopes, 340 feet south and 65 feet west of the northeast corner of sec. 14, T. 31 N., R. 12 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) heavy silt loam; common dark grayish brown (10YR 4/2) mottles; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint brown (10YR 5/3) mottles; moderate very fine granular structure; friable; very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B21t—13 to 16 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; firm; dark grayish brown (10YR 4/2) coatings on ped faces; medium acid; gradual smooth boundary.

B22t—16 to 21 inches; grayish brown (10YR 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; firm; dark gray (10YR 4/1) coatings on ped faces; medium acid; clear smooth boundary.

B23t—21 to 27 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate very fine subangular blocky; firm; very dark gray (10YR 3/1) and dark gray (10YR 4/1) coatings on ped faces; mildly alkaline; clear smooth boundary.

B24t—27 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium prominent gray (5Y 5/1) mottles and common fine faint yellowish brown mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm;

discontinuous very dark gray (10YR 3/1) coatings on ped faces; mildly alkaline; clear smooth boundary.

B3—32 to 37 inches; yellowish brown (10YR 5/6) silty clay loam; many coarse prominent gray (5Y 5/1) mottles; weak coarse prismatic structure parting to weak and moderate medium blocky; firm; discontinuous very dark gray (10YR 3/1) coatings on ped faces; slightly effervescent; moderately alkaline; clear smooth boundary.

C—37 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6 and 5/8) mottles and common fine prominent greenish gray (5GY 5/1) mottles; weak coarse prismatic structure parting to massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 16 inches in thickness. It is silt loam or light silty clay loam. The Ap horizon is very dark gray or very dark grayish brown, and the A2 horizon is dark grayish brown, grayish brown, or brown. The B horizon is silty clay loam or silty clay. The C horizon is silty clay loam and some clay loam, calcareous glacial till.

Beecher soils are associated with Ashkum, Markham, Morley, and Milford soils. Beecher soils are better drained than Milford and Ashkum soils and more poorly drained than Markham and Morley soils.

298A—Beecher silt loam, 0 to 2 percent slopes. This is a nearly level soil on broad plains or in irregularly shaped areas on the more rolling moraines. It has the profile described as representative of the series. Included in mapping are small areas of Markham silt loam, 1 to 4 percent slopes, and Andres silt loam.

A seasonal high water table and the slow permeability are somewhat severe limitations to the use of this soil. Some areas need additional artificial drainage for cultivation early in spring. Tile drains that have surface inlets improve drainage. Management group IIw-4.

298B—Beecher silt loam, 2 to 4 percent slopes. This soil occupies the higher areas or is on short side slopes between better drained and more poorly drained soils. It has a profile similar to the one described as representative of the series, but the subsoil is heavier in texture.

Included with this soil in mapping are small areas of Elliott silt loam, 2 to 4 percent slopes, and Markham silt loam, 1 to 4 percent slopes. Also included are many small areas of eroded soils.

This soil is suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. Cultivation is commonly delayed early in spring because of small, wet areas. These areas need artificial drainage. The size and shape of the areas of soil limit the use of some erosion control practices. Contour farming and conservation tillage help to reduce soil losses. Management group IIe-2.

Bonfield Series

The Bonfield series consists of nearly level, somewhat poorly drained soils on glacial outwash plains. These soils formed in loamy glacial outwash and the underlying cobbly material. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark grayish brown loam and fine sandy loam about 14 inches thick. The subsoil is 12 inches thick. In the upper 6 inches it is mottled yellowish brown heavy fine sandy loam, and in the lower 6 inches it is moderately alkaline, yellowish brown, very cobbly fine sandy loam. The underlying material is calcareous, very pale brown and brownish yellow, very cobbly fine sandy loam. The cobbles are dominantly somewhat rounded limestone and average 4 to 6 inches in diameter.

Permeability is moderately rapid, and the available water capacity is moderate. The organic-matter content is moderate.

Most areas of these soils are used intensively for corn and soybeans. Bonfield soils are also well suited to the other commonly grown crops.

Representative profile of Bonfield loam, 36 feet north and 30 feet east of the southwest corner of sec. 34, T. 31 N., R. 10 E.

Ap—0 to 9 inches; black (10YR 2/1) loam; moderate medium granular structure; friable; neutral; clear smooth boundary.

A3—9 to 14 inches; very dark grayish brown (10YR 3/2) heavy fine sandy loam; moderate medium granular structure; friable; continuous black (10YR 2/1) coatings on ped faces; neutral; clear smooth boundary.

B2—14 to 20 inches; yellowish brown (10YR 5/4) heavy fine sandy loam; many fine faint dark grayish brown (10YR 4/2) mottles; weak very fine subangular blocky structure; friable; very dark gray (10YR 3/1) coatings on vertical ped faces; slightly effervescent; mildly alkaline; clear smooth boundary.

IIB3—20 to 26 inches; yellowish brown (10YR 5/4) very cobbly fine sandy loam; weak medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings on ped faces; strongly effervescent; moderately alkaline; gradual smooth boundary.

IIC—26 to 50 inches; very pale brown (10YR 7/4) and brownish yellow (10YR 6/6) very cobbly fine sandy loam; single grained; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 18 inches in thickness. It is commonly loam but ranges to fine sandy loam and light clay loam. The upper part of the B horizon is mainly heavy fine sandy loam but includes loam and light clay loam. The lower part is cobbly or very cobbly fine sandy loam. The depth to the cobbly material ranges from 15 to 30 inches. The C horizon ranges from a few feet to more than 20 feet in thickness. The size and percentage of cobbles in the matrix varies in relation to the distance from the primary source of the limestone.

Bonfield soils are associated with Kankakee and Fieldon soils. Bonfield soils are more poorly drained than Kankakee soils and better drained than Fieldon soils.

493—Bonfield loam. This is a nearly level soil on glacial outwash plains. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Kankakee fine sandy loam, 0 to 2 percent slopes, and small areas of Fieldon loam. Wet areas and calcareous areas are shown on the soil map by conventional symbols.

This soil is suited to the crops commonly grown in the county. A seasonal high water table and the moderate available water capacity are limitations to use. A few areas need additional artificial drainage for cultivation early in spring. Drainage should be provided as needed by tiles or open ditches. Management practices that increase organic-matter content and prevent soil blowing help to increase the productivity of this soil. Management group IIs-2.

Bryce Series

The Bryce series consists of nearly level, poorly drained soils in low-lying glacial lakebeds and till areas. The native vegetation was prairie grasses adapted to swamp conditions.

In a representative profile the surface layer is black silty clay about 11 inches thick. The subsoil is about 29 inches thick. It is very dark gray, dark gray, and gray silty clay that has olive and yellowish brown mottles. The underlying material is gray silty clay that has prominent yellowish brown mottles.

Permeability is slow, and the available water capacity is moderate. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Bryce soils are well suited to most crops, including legumes and pasture.

Representative profile of Bryce silty clay, 36 feet south and 2,602 feet west of the northeast corner of sec. 7, T. 29 N., R. 12 W.

Ap—0 to 7 inches; black (N 2/0) silty clay; moderate fine granular structure; firm; neutral; abrupt smooth boundary.

A12—7 to 11 inches; black (N 2/0) silty clay; moderate medium granular structure; firm; neutral; clear smooth boundary.

B1g—11 to 15 inches; very dark gray (5Y 3/1) silty clay; many fine faint olive (5Y 5/4) mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; very dark gray (5Y 3/1) coatings on ped faces; neutral; clear smooth boundary.

B21g—15 to 22 inches; gray (5Y 5/1) heavy silty clay; many fine faint olive (5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; very dark gray (5Y 3/1) coatings on vertical ped faces; mildly alkaline; clear smooth boundary.

B22g—22 to 30 inches; dark gray (5Y 4/1) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; very dark gray (5Y 3/1) coatings on vertical ped faces; mildly alkaline; clear smooth boundary.

B3g—30 to 40 inches; gray (5Y 5/1) silty clay; many medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; discontinuous very dark gray (5Y 3/1) coatings on vertical ped faces; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cg—40 to 60 inches; gray (5Y 5/1) silty clay; many coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse prismatic structure grading to massive; firm; strongly effervescent; moderately alkaline.

In most places the solum ranges from 38 to 50 inches in thickness. The A horizon ranges from 10 to 18 inches in thickness. It is heavy silty clay loam or heavy silty clay that has a high sand content in many areas. The B horizon is mainly silty clay or clay, but in places it is silty clay loam in the lower part. The C horizon is mixed gray, greenish gray, and yellowish brown, compact silty clay that is stratified in places.

Bryce soils are associated with Frankfort and Mokena soils. They are more poorly drained and are in lower positions on the landscape than Frankfort and Mokena soils. Bryce soils have more clay throughout the profile than the poorly drained Milford or Ashkum soils.

235—Bryce silty clay. This is a nearly level soil in broad, irregularly shaped areas. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Mokena loam and Frankfort silt loam, 0 to 2 percent slopes. Also included are small areas of Milford silty clay loam and small areas of overwash material. Wet areas, calcareous areas, and gray spots are shown on the soil map by conventional symbols.

A seasonal high water table, the slow permeability, and the high clay content can be serious limitations to the use of this soil. Runoff is slow or ponded. Many areas need additional artificial drainage for cultivation early in spring. Shallow surface drains and random tile lines that have surface inlets improve drainage where needed. Management group IIw-4.

Channahon Series

The Channahon series consists of shallow, nearly level to gently sloping, well drained soils along the Kankakee River Valley. These soils formed in very thin deposits of loamy glacial outwash material 10 to 20 inches deep over limestone bedrock. The native vegetation was mainly prairie grasses with scattered bushes and trees in some areas.

In a representative profile the surface layer is very dark gray silt loam about 8 inches thick. The subsoil is about 8 inches thick. It is dark yellowish brown silty clay loam and silt loam that has a high sand content. Slightly weathered limestone bedrock is at a depth of 16 inches.

Permeability is moderate above the limestone. The available water capacity is low. The organic-matter content is moderate.

Because of the shallow root zone, Channahon soils are better suited to small grain or meadow crops than to corn and soybeans. The shallow depth to bedrock is a very serious limitation to use.

Representative profile of Channahon silt loam, 0 to 2 percent slopes, 63 feet east and 985 feet north of the southwest corner of sec. 30, T. 31 N., R. 12 E.

A1—0 to 8 inches; very dark gray (10YR 3/1) silt loam that has a high sand content; moderate fine granular structure; friable; neutral; clear smooth boundary.

B2t—8 to 14 inches; dark yellowish brown (10YR 3/4) light silty clay loam that has a high sand content; moderate fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) coatings on ped faces; slightly acid; clear smooth boundary.

B3—14 to 16 inches; dark yellowish brown (10YR 3/4) silt loam to loam; weak fine subangular blocky structure; friable; discontinuous very dark grayish brown (10YR 3/2) coatings on ped faces; neutral; abrupt smooth boundary.

IIR—16 inches; level bedded, slightly weathered limestone bedrock.

The A horizon ranges from 4 to 10 inches in thickness. The B horizon ranges from 6 to 14 inches in thickness. In most places it is clay loam or silty clay loam that has a high sand content. In places, the lower part of the B horizon is sand or cobbly fine sandy loam. The horizon above the limestone is variable, but a thin horizon formed in residuum weathered from the limestone occurs only in some small areas. The underlying limestone is slightly weathered.

Channahon soils are on the same landscape as Rockton, Faxon, and Ritchey soils. Channahon soils are more shallow to limestone than Rockton and Faxon soils. They have a thicker and darker colored surface layer than Ritchey soils.

315A—Channahon silt loam, 0 to 2 percent slopes. This is a nearly level soil in somewhat elongated areas of the Kankakee River Valley or near old glacial channels of the Valley. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Rockton loam, 0 to 2 percent slopes, and Channahon silt loam, 2 to 4 percent slopes. Also included are small areas of soils that are less than 10 inches thick to limestone.

This soil is suited to small grain or meadow crops. It has very limited suitability for the other crops because it has a shallow rooting depth. Management group IIIs-3.

315B—Channahon silt loam, 2 to 4 percent slopes. This is a gently sloping soil in somewhat elongated areas where slopes are short.

Included with this soil in mapping are small areas of Rockton loam, 2 to 4 percent slopes; Channahon silt loam, 0 to 2 percent slopes; and Ritchey silt loam, 2 to 6 percent slopes. Also included are small areas of eroded soils and areas of soils that are less than 10 inches thick to bedrock. These eroded and shallow areas are indicated on the soil map by conventional symbols.

This soil is suited to small grain or meadow crops. It is subject to severe erosion when used for row crops. It has very limited suitability for other crops because it is subject to erosion and is shallow to bedrock. Management group IIIs-3.

Chelsea Series

The Chelsea series consists of nearly level to moderately sloping, excessively drained soils in the higher, better drained positions on the landscape. These soils are on mounds or on prominent, narrow, elongated, sandbarlike ridges. They formed in sandy glacial outwash material. The native vegetation was hardwood trees.

In a representative profile the surface layer is dark grayish brown fine sand about 5 inches thick. The subsurface layer is yellowish brown fine sand about 39 inches thick. The subsoil to a depth of 60 inches is brownish yellow fine sand separated by bands of strong brown and brown loamy fine sand (fig. 4).

Permeability is rapid, and the available water capacity is low. The organic-matter content is low.

The gently sloping Chelsea soils are better suited to small grain and meadow crops than to corn and soybeans. The moderately sloping soils are better suited to a permanent cover of meadows or trees. When farmed with surrounding soils, these soils need special protection from soil blowing.

Representative profile of Chelsea fine sand, 1 to 6 percent slopes, 1,298 feet west and 197 feet south of the northeast corner of sec. 30, T. 31 N., R. 11 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) fine sand; very weak fine granular structure parting to single grained; loose; slightly acid; clear smooth boundary.

A2—5 to 44 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; medium acid; abrupt smooth boundary.

A&B—44 to 60 inches; brownish yellow (10YR 6/6) fine sand (A22); single grained; loose; strong brown (7.5YR 5/6) and brown (7.5YR 4/4) loamy fine sand (B); weak medium and coarse subangular blocky structure; friable; 1 to 2 inch thick lamellae make up 5 inches of this horizon; medium acid.

The A horizon is fine sand or loamy fine sand. Thickness and color vary with vegetative cover or amount of erosion. The A&B horizon ranges from 2 to 12 feet or more in thickness.

Chelsea soils are better drained and lighter colored than Hoopeston and Gilford soils. They are lighter colored than Ade soils.

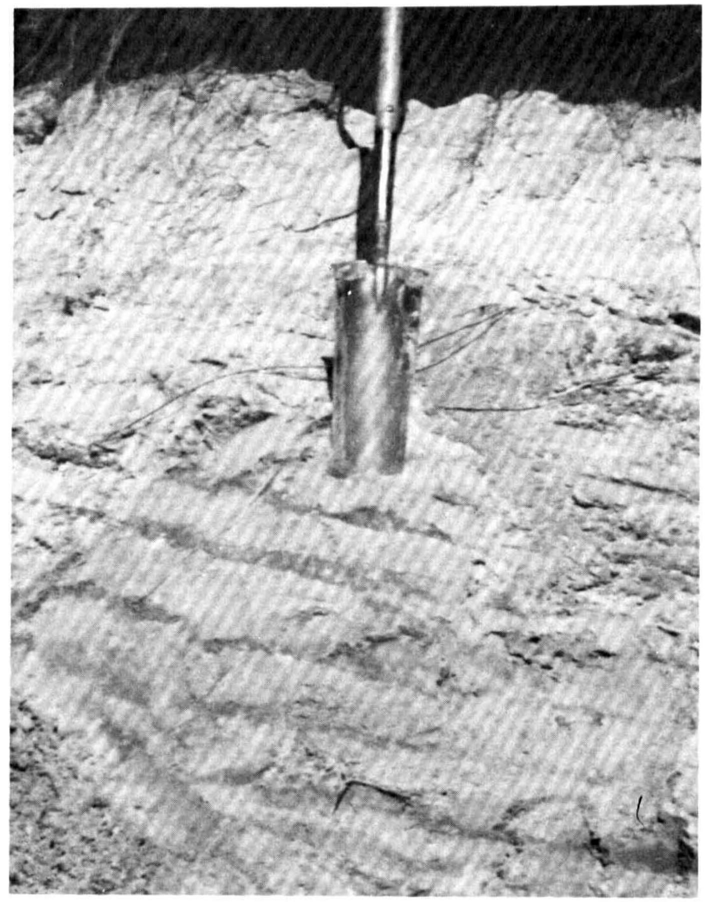

Figure 4.—A profile of Chelsea fine sand with lamellae 4 to 10 feet below the surface.

779B—Chelsea fine sand, 1 to 6 percent slopes. This is a nearly level to moderately sloping soil on mounds or elongated ridges that are higher than the surrounding, more poorly drained soils. In some areas the bands in the subsoil extend to a depth of less than 60 inches and are terminated by the underlying gray sand or by the water table. Included in mapping are small areas of Ade loamy fine sand, 1 to 5 percent slopes, and Hoopeston fine sandy loam.

The low available water capacity and natural fertility and the risk of soil blowing are serious limitations to the use of this soil. If this soil is used for crops, conservation tillage and other practices that conserve fertility and moisture are needed. Management group IVs-1.

Comfrey Series

The Comfrey series consists of poorly drained, nearly level soils in depressions and on bottom lands. These soils formed in recent water-laid sediment in glacial outwash areas.

In a representative profile the surface layer is black clay loam about 26 inches thick. The subsoil is 20 inches thick. In the upper 13 inches it is dark gray clay loam that has a few thin strata of loam, and in the lower 7 inches it is gray loam that has a few thin strata of sandy loam. The underlying material is gray, stratified sandy loam and loamy sand.

Permeability is moderate, and the available water capacity is high. The organic-matter content is high.

If adequately drained, Comfrey soils are suited to corn and soybeans. Because of frequent flooding, many areas are in pasture. A severe flooding hazard and a very high water table are the major limitations to use.

Representative profile of Comfrey clay loam from an area of Comfrey soils, 45 feet east and 1,130 feet south of the northwest corner of sec. 22, T. 30 N., R. 14 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam; moderate very fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

A12—9 to 26 inches; black (10YR 2/1) light clay loam; moderate fine granular structure; friable; mildly alkaline; clear smooth boundary.

B1g—26 to 39 inches; dark gray (10YR 4/1) clay loam that has a few thin strata of loam; many medium faint light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces, krotovinas; mildly alkaline; clear smooth boundary.

B2g—39 to 46 inches; gray (5Y 6/1) loam that has a few strata of sandy loam; many coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak prismatic structure parting to weak medium and coarse subangular blocky; friable; dark gray (10YR 4/1) coatings on vertical ped faces; dark gray (10YR 4/1) krotovinas; mildly alkaline; clear smooth boundary.

C—46 to 62 inches; gray (5Y 6/1) stratified sandy loam and loamy sand; many coarse prominent yellowish brown (10YR 5/6) mottles; single grained; loose; neutral.

The A horizon ranges from 24 to 36 inches in thickness. It is black and very dark gray silt loam to clay loam. The B horizon is very dark gray to gray. It ranges from loam and sandy clay loam to clay loam that has thin strata of sandy loam. The C horizon is stratified sandy loam and loamy sand glacial outwash.

Comfrey soils are associated with Gilford, Selma, and Sawmill soils. Comfrey soils have a thicker A horizon than Gilford and Selma soils. They have more sand throughout the profile than Sawmill soils.

776—Comfrey soils. These are nearly level soils in depressions and on bottom lands that are subject to flooding or ponding. The surface layer ranges from clay loam to silt loam. Slope is 0 to 2 percent.

Included with this unit in mapping are small areas of Gilford fine sandy loam, Selma loam, Sawmill silty clay loam, and other similar soils. Also included are small areas that are too wet for cultivation.

Most areas of these soils are used for corn and soybeans. Excess water in spring and early in summer commonly causes crop damage. The use of Comfrey soils depends on adequate drainage. If drainage systems cease to function or if the weather is extremely wet, these areas revert to a marshy condition. Providing adequate drainage and maintaining good tilth are necessary for sustained crop production. Management group IIw-1.

Darroch Series

The Darroch series consists of nearly level, somewhat poorly drained soils on glacial outwash plains. These soils formed in medium textured glacial outwash material. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark grayish brown silt loam about 14 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown silty clay loam in the upper part, brown silty clay loam in the middle part, and grayish brown silty clay loam and loam in the lower part. It has yellowish brown mottles that become larger and brighter with increasing depth. The underlying material is grayish brown, stratified loam and gravelly sandy loam. It is moderately alkaline glacial outwash material.

Permeability is moderately slow, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. They are well suited to these and the other commonly grown crops.

Representative profile of Darroch silt loam, 68 feet north and 528 feet west of the southeast corner of sec. 36, T. 31 N., R. 12 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam that has a high sand content; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A12—10 to 14 inches; very dark grayish brown (10YR 3/2) silt loam that has a high sand content; moderate fine granular structure; friable; very dark gray (10YR 3/1) coatings on ped faces; neutral; clear smooth boundary.

B21t—14 to 17 inches; dark grayish brown (10YR 4/2) light silty clay loam that has a high sand content; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; very dark gray (10YR 3/1) coatings on ped faces; medium acid; clear smooth boundary.

B22t—17 to 25 inches; brown (10YR 5/3) silty clay loam that has a high sand content; common fine distinct yellowish brown (10YR 5/6) mottles; few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B23t—25 to 34 inches; grayish brown (10YR 5/2) silty clay loam that has a high sand content, clay loam in lower 3 inches; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on ped faces; neutral; gradual smooth boundary.

B3—34 to 43 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few dark gray (10YR 4/1) coatings on vertical ped faces; mildly alkaline; clear smooth boundary.

C—43 to 60 inches; grayish brown (10YR 5/2) stratified loam and gravelly sandy loam; many coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to massive; friable; slightly effervescent; moderately alkaline.

The A horizon ranges from 10 to 16 inches in thickness. It is black or very dark grayish brown silt loam or loam. The B2 horizon is silty clay loam that has a high sand content or it is clay loam or loam. The B3 horizon ranges from loam to sandy loam. The C horizon is mostly stratified sandy loam, loam, loamy sand, and thin gravelly layers.

Darroch soils are associated with Beardstown, Selma, and Jasper soils. Darroch soils are better drained than Selma soils, but they are not so well drained as Jasper soils. Darroch soils have drainage similar to that of Beardstown soils, but they are darker colored and lack the prominent A2 horizon that Beardstown soils have.

740—Darroch silt loam. This is a nearly level soil in irregularly shaped areas that are somewhat higher than the flat surrounding areas. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Selma loam and Jasper silt loam, 0 to 2 percent slopes. Also included are small areas where glacial till, bedrock, or rubble is at a depth of 45 to 60 inches.

This soil is very well suited to the crops commonly grown in the county. It can be cropped intensively. Some areas that are to be cultivated early in spring need artificial drainage. In such areas tile drainage increases crop yields. Management group IIw-3.

Elliott Series

The Elliott series consists of nearly level to gently sloping, somewhat poorly drained soils on moraines. These soils formed in thin deposits of silty material and the underlying silty clay loam glacial till. The native vegetation was prairie grasses.

In a representative profile the surface layer is black silt loam and heavy silt loam about 14 inches thick. The subsoil is about 27 inches thick. In the upper 4 inches it is dark grayish brown heavy silty clay loam; in the middle 7 inches it is grayish brown light silty clay; and in the lower 16 inches it is brown silty clay loam. The subsoil has yellowish brown mottles in the lower 23 inches. The underlying material is brown, calcareous silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Elliott soils are well suited to these and other commonly grown crops.

Representative profile of Elliott silt loam, 0 to 2 percent slopes, 348 feet east and 1,175 feet north of the southwest corner of sec. 34, T. 30 N., R. 9 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—9 to 14 inches; black (10YR 2/1) heavy silt loam; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

IIB21t—14 to 18 inches; dark grayish brown (10YR 4/2) heavy silty clay loam; many fine faint grayish brown (10YR 5/2) mottles; moderate very fine and fine subangular blocky structure; firm; black (10YR 2/1) coatings on ped faces; medium acid; clear smooth boundary.

IIB22t—18 to 25 inches; grayish brown (10YR 5/2) light silty clay; many fine distinct yellowish brown (10YR 5/6) mottles and many fine faint gray (5Y 5/1) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on ped faces; slightly acid; clear smooth boundary.

IIB3—25 to 41 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium to coarse subangular blocky; firm; dark gray (10YR 4/1) coatings on vertical ped faces; slightly effervescent; moderately alkaline; gradual wavy boundary.

IIC—41 to 60 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse prismatic structure parting to massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 16 inches in thickness. It is black or very dark grayish brown silt loam or silty clay loam and has variable amounts of sand. The Bt horizon is heavy silty clay loam or silty clay and has variable amounts of sand. The lower part of the B horizon reflects the characteristics of the underlying glacial till. The C horizon is dominantly calcareous silty clay loam glacial till, but in places the till is clay loam.

Elliott soils are on the same landscape as the lower lying, more poorly drained Ashkum soils and the higher lying, better drained Varna soils.

146A—Elliott silt loam, 0 to 2 percent slopes. This is a nearly level soil in irregularly shaped areas on broad till plains. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Ashkum silty clay loam and Beecher silt loam, 0 to 2 percent slopes. Also included are small areas of Varna silt loam, 1 to 4 percent slopes, and areas where the surface layer is thinner than is described as the range of the series.

This soil is suited to the crops commonly grown in the county. A seasonal high water table and the moderately slow permeability are severe limitations to some uses. Some areas that are to be cultivated early in spring need artificial drainage. Tile drains improve drainage where needed. Management group IIw-3.

146B—Elliott silt loam, 2 to 4 percent slopes. This is a gently sloping soil that occupies the higher areas or is on short side slopes surrounded by more poorly drained, nearly level soils. It has a profile similar to the one described as representative of the series, but the surface layer is thinner.

Included with this soil in mapping are small areas of Elliott silt loam, 0 to 2 percent slopes, and Varna silt loam, 1 to 4 percent slopes. Also included are many small areas of eroded soils. Larger areas of eroded soils are shown on the soil map by a conventional symbol.

This soil is suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. Some areas need artificial drainage for cultivation early in spring. The size and shape of the areas of soil limit the use of some erosion control practices. Contour farming and conservation tillage help to reduce soil losses. Management group IIe-2.

Faxon Series

The Faxon series consists of nearly level, moderately deep, poorly drained soils along the Kankakee River Valley. These soils formed in thin deposits of loamy material. Limestone bedrock is 20 to 40 inches below the surface. The native vegetation was water-tolerant prairie grasses and swamp grasses.

In a representative profile the surface layer is black and very dark gray clay loam about 17 inches thick. The subsoil is about 11 inches thick. In the upper 8 inches it is grayish brown clay loam, and in the lower 3 inches it is grayish brown loam. Slightly weathered limestone bedrock is at a depth of 28 inches.

Permeability is moderate above the limestone. The available water capacity is moderate. The organic-matter content is high.

Because of the limited rooting depth, Faxon soils have only limited suitability for corn and soybeans. Where adequately drained, most areas are used for corn and soybeans.

Representative profile of Faxon clay loam, 1,272 feet east and 2,610 feet south of the northwest corner of sec. 35, T. 31 N., R. 11 E.

Ap—0 to 9 inches; black (10YR 2/1) clay loam; moderate fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

A3—9 to 17 inches; very dark gray (10YR 3/1) clay loam; moderate very fine subangular blocky structure; friable; mildly alkaline; clear smooth boundary.

B2g—17 to 25 inches; grayish brown (2.5Y 5/2) clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; mildly alkaline; clear smooth boundary.

B3g—25 to 28 inches; grayish brown (2.5Y 5/2) loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; common very dark gray (10YR 3/1) krotovinas; mildly alkaline; abrupt smooth boundary.

IIR—28 inches; light gray (10YR 7/2) slightly weathered limestone bedrock.

Depth to limestone bedrock ranges from 20 to 40 inches. The A horizon ranges from 11 to 18 inches in thickness. It is loam or clay loam. The B horizon is dominantly clay loam but loam and sandy clay loam are within the range.

Faxon soils are associated with Rockton, Channahon, and Selma loam, bedrock substratum, soils. Faxon soils are more poorly drained than Rockton and Channahon soils. They are more shallow to bedrock than Selma loam, bedrock sustratum soils.

516—Faxon clay loam. This is a nearly level soil in broad areas on glacial outwash plains.

Included with this soil in mapping are small areas of Rockton loam, 0 to 2 percent slopes, and Channahon silt loam, 0 to 2 percent slopes. Also included are small areas of Selma loam, bedrock substratum, and some areas where a thin sandy or gravelly layer is above the limestone. Wet areas and calcareous areas are shown on the soil map by conventional symbols.

A seasonal high water table in all areas and the risk of ponding in the lower lying areas can be serious limitations to the use of this soil. Runoff is slow. Because this soil is shallow to bedrock, tiling is not always practical, and most cultivated areas are drained by open ditches. Many areas need artificial drainage for cultivation early in spring. Management group IIIw-3.

Fieldon Series

The Fieldon series consists of nearly level, calcareous, poorly drained soils in glacial outwash areas. These soils formed in loamy glacial outwash material that has a concentration of snail shells. The native vegetation was swamp grasses.

In a representative profile the surface layer is black and very dark gray loam and fine sandy loam about 19 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown and grayish brown loam and fine sandy loam that has light olive brown mottles. The underlying material is light olive brown, stratified loamy sand and sand.

Permeability is moderate, and the available water capacity is high. The organic-matter content is high.

Fieldon soils are farmed intensively. If fertilizer is applied in appropriate amounts, these soils are well suited to all the commonly grown crops.

Representative profile of Fieldon loam, 2,275 feet north and 30 feet west of the center of sec. 2, T. 30 N., R. 9 E.

A1—0 to 13 inches; black (10YR 2/1) loam; weak fine granular structure; friable; strongly effervescent; moderately alkaline; clear smooth boundary.

A3—13 to 19 inches; very dark gray (10YR 3/1) heavy fine sandy loam; weak fine granular structure; friable; strongly effervescent; moderately alkaline; clear smooth boundary.

B21g—19 to 22 inches; dark grayish brown (2.5Y 4/2) light loam; few fine distinct light olive brown (2.5Y 5/4) mottles; weak fine subangular blocky structure; friable; discontinuous very dark gray (10YR 3/1) coatings on ped faces; strongly effervescent; moderately alkaline; gradual smooth boundary.

B22g—22 to 40 inches; grayish brown (2.5Y 5/2) loam; few fine distinct light olive brown (2.5Y 5/6) mottles; weak medium subangular blocky structure; friable; common very dark gray (10YR 3/1) krotovinas; strongly effervescent; moderately alkaline; gradual smooth boundary.

B3g—40 to 48 inches; grayish brown (2.5Y 5/2) fine sandy loam; many coarse distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; friable; strongly effervescent; moderately alkaline; gradual smooth boundary.

IIC—48 to 60 inches; light olive brown (2.5Y 5/6) stratified loamy sand and sand; many coarse distinct light brownish gray (10YR 6/2) mottles; single grained; loose; moderately alkaline; slightly effervescent.

Broken snail shells occur throughout the solum, but the concentration is variable. The A horizon ranges from 12 to 20 inches in thickness. It is fine sandy loam to light clay loam. The B horizon is commonly fine sandy loam or loam but in places is clay loam. The C horizon is stratified loamy sand, sand, and, in places, loam.

Fieldon soils are associated with Gilford, Hoopeston, and Reddick soils. The moderately alkaline reaction distinguishes Fieldon soils from these associated soils.

380—Fieldon loam. This is a nearly level soil in poorly drained areas on sandy glacial outwash plains.

Included with this soil in mapping are small areas of soils that have layers that are very high in lime content and small areas of soils that are not calcareous. Also included are small areas where the underlying material is cobbly loamy sand. Wet areas are shown on the soil map by a conventional symbol.

Surface and tile drainage are needed if this soil is to be used for cultivated crops, especially early in spring. Management group IIIw-3.

Frankfort Series

The Frankfort series consists of nearly level to moderately sloping, somewhat poorly drained soils on irregularly shaped ridges and side slopes in fine textured glacial till and glacial lakebed areas. These soils formed in silty clay glacial drift. The native vegetation was mixed grasses and trees.

In a representative profile the surface layer is very dark gray heavy silt loam about 8 inches thick. The subsoil is about 26 inches thick. In the upper 10 inches it is grayish brown silty clay that has yellowish brown mottles, and in the lower 16 inches it is light olive brown and gray silty clay that has yellowish brown mottles. The underlying material is gray, compact, calcareous, silty clay glacial till that has yellowish brown mottles.

Permeability is slow, and available water capacity is moderate. The organic-matter content is moderate.

Most areas of Frankfort soils are suited to the commonly grown crops, but in severely eroded areas the soils are better suited to small grain and meadow crops. Controlling erosion and increasing the organic-matter content are the major management concerns.

Representative profile of Frankfort silt loam, 2 to 6 percent slopes, 45 feet west and 360 feet north of the southeast corner of sec. 12, T. 29 N., R. 13 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) heavy silt loam; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B21t—8 to 11 inches; grayish brown (10YR 5/2) light silty clay; common fine faint yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; firm; dark gray (10YR 4/1) coatings on ped faces; slightly acid; clear smooth boundary.

B22t—11 to 18 inches; grayish brown (2.5Y 5/2) heavy silty clay; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to strong very fine subangular blocky; very firm; dark grayish brown (10YR 4/2) coatings on ped faces; slightly acid; clear smooth boundary.

B23t—18 to 25 inches; light olive brown (2.5Y 5/4) heavy silty clay; many medium distinct yellowish brown (10YR 5/4) mottles and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to strong fine subangular blocky; very firm; dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) coatings on ped faces; neutral; clear smooth boundary.

B3—25 to 34 inches; gray (5Y 5/1) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; dark grayish brown (10YR 4/2) coatings on vertical ped faces; slightly effervescent; moderately alkaline; gradual wavy boundary.

C—34 to 60 inches; gray (5Y 5/1) silty clay; many medium distinct light yellowish brown (10YR 6/4) mottles; weak coarse prismatic structure parting to massive; firm; common light gray (10YR 7/1) lime concretions; strongly effervescent; moderately alkaline.

The A horizon ranges from 7 to 14 inches in thickness. It is silt loam that has a high sand content, or it is silty clay loam. The B horizon is dominantly silty clay but in some places is clay or silty clay loam. The lower part of the B horizon and the C horizon are compact silty clay that has variable gray and yellowish brown colors.

Frankfort soils are associated with Bryce and Mokena soils. They are better drained than Bryce soils. Frankfort soils formed in fine textured glacial drift and lakebed material; in Mokena soils the upper part of the solum formed in loamy glacial outwash material.

320A—Frankfort silt loam, 0 to 2 percent slopes. This is a nearly level soil on ridges. It has a profile similar to the one described as representative of the series, but it has a thicker surface layer that is darker colored in places. In some areas that are not disturbed by plowing, this soil has a grayish subsurface layer.

Included with this soil in mapping are small areas of Bryce silty clay and Frankfort silt loam, 2 to 6 percent slopes. Also included are small areas where the surface layer and upper part of the subsoil have a high sand content.

A seasonal high water table and the slow permeability are limitations to the use of this soil. Adequate surface drainage and increased organic-matter content are needed for sustained crop production. Management group IIw-4.

320B—Frankfort silt loam, 2 to 6 percent slopes. This is a gently sloping to moderately sloping soil on irregularly shaped ridges or side slopes of drainageways in areas where the topography is very irregular. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Frankfort silt loam, 0 to 2 percent slopes, and Bryce silty clay. Also included are areas where the surface layer is lighter colored than is described as the range of the series and small areas where the surface layer and upper part of the subsoil have a high sand content. Areas of eroded soils are indicated on the soil map by a conventional symbol.

The hazard of water erosion, a seasonal high water table, and the slow permeability are limitations to the use of this soil. The size and shape of the areas of soil limit the use of some erosion-control practices. Erosion can be controlled by use of conservation tillage, crop rotations, and grassed waterways. Contour farming should be used where practical. Management group IIIe-1.

Gilford Series

The Gilford series consists of nearly level, very poorly drained soils in broad glacial outwash areas. These soils formed in loamy and sandy glacial outwash material. The native vegetation was water-tolerant prairie grasses, reeds, and sedges.

In a representative profile the surface layer is black and very dark gray fine sandy loam about 16 inches thick. The subsoil is about 21 inches thick. In the upper 8 inches it is gray light sandy clay loam that has yellowish brown mottles; in the middle 7 inches it is gray fine sandy loam that has yellowish brown mottles; and in the lower 6 inches it is gray stratified loamy fine sand. The underlying material is gray, stratified loamy fine sand. It is loose, neutral, glacial outwash material.

Permeability is moderately rapid, and the available water capacity is moderate. The organic-matter content is high.

Most areas of Gilford soils are used intensively for corn and soybeans. The soils are suited to these and to the other commonly grown crops.

Representative profile of Gilford fine sandy loam, 2,329 feet north and 606 feet east of the center of sec. 1, T. 31 N., Rl 14 E.

Ap—0 to 11 inches; black (N 2/0) fine sandy loam; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A12—11 to 16 inches; very dark gray (10YR 3/1) fine sandy loam; weak very fine granular structure; friable; patchy black (10YR 2/1) coatings on ped faces; neutral; clear smooth boundary.

B21g—16 to 24 inches; gray (10YR 5/1) light sandy clay loam; many fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate very fine subangular blocky; firm; patchy very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear wavy boundary.

B22g—24 to 31 inches; gray (10YR 5/1) fine sandy loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; continuous dark gray (10YR 4/1) coatings on ped faces; slightly acid; clear wavy boundary.

B3g—31 to 37 inches; gray (5Y 5/1) loamy fine sand that has thin strata of fine sand and common fine gravel; weak medium prismatic structure parting to moderate fine subangular blocky; friable; patchy dark gray (10YR 4/1) coatings on the vertical ped faces; neutral; clear wavy boundary.

Cg—37 to 60 inches; gray (5Y 5/1) loamy fine sand that has gravelly strata; single grained; loose; neutral.

The A horizon ranges from 12 to 18 inches in thickness. It is light fine sandy loam to loam. The B2 horizon is dominantly fine sandy loam, but in many places the subhorizons are loam or sandy clay loam. The C horizon contains strata of gravelly loam or gravelly silt loam in many places. It ranges from neutral to moderately alkaline.

Gilford soils are associated with Hoopeston, Ade, and Selma soils. Gilford soils are more poorly drained than Hoopeston and Ade soils. They have less clay throughout the solum than Selma soils.

201—Gilford fine sandy loam. This is a nearly level soil on low-lying glacial outwash plains. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Maumee loamy fine sand, Hoopeston fine sandy loam, and Selma loam. Also included are areas where the subsoil contains less clay than is described as representative of the series. Wet areas and swampy areas are shown on the soil map by conventional symbols.

If properly managed, this soil is well suited to the crops commonly grown in the county. A seasonal high water table, the risk of ponding in the lower lying areas (fig. 5), and the moderate available water capacity are limitations to use. Many areas that are to be cultivated early in spring need artificial drainage. Open ditches with water control structures, where needed, and tile drains that are properly protected from being filled with sand help to control the moisture supplied to crops. Conservation tillage is needed to control soil blowing. Management group IIIw-1.

W201—Gilford fine sandy loam, wet. This is a nearly level to depressional soil that is subject to frequent flooding or ponding. Water commonly covers the ground for long periods. The vegetation consists of water-tolerant trees or swamp grasses.

Included with this soil in mapping are small, wet areas of Selma loam and Maumee loamy fine sand. Also included are small areas of riverwash material.

Wetness is a very serious limitation to the use of this soil. Many areas need artificial drainage for cultivation early in spring. Some areas are cultivated but are not productive. Some areas are used for pasture, woodland, or recreation. The marshy areas can be used for wetland wildlife habitat. Management group VIIw-1.

Hoopeston Series

The Hoopeston series consists of nearly level, somewhat poorly drained soils. These soils formed in loamy to sandy glacial outwash material. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark gray fine sandy loam about 13 inches thick. The subsoil is about 33 inches thick. In the upper 20 inches it is dark grayish brown and grayish brown fine sandy loam that has yellowish brown and gray mottles, and in the lower 13 inches it is grayish brown stratified fine sandy loam, loamy fine sand, and silt loam. The underlying material is gray, stratified fine sandy loam, silt loam, and loamy fine sand.

Permeability is moderately rapid, and the available water capacity is moderate. The organic-matter content is moderate.

Hoopeston soils are used intensively for corn and soybeans. Management is needed to conserve moisture, increase the organic-matter content, and regulate fertility. These soils are subject to soil blowing if left unprotected when cultivated.

Representative profile of Hoopeston fine sandy loam, 54 feet north and 1,842 feet west of the southeast corner of sec. 26, T. 29 N., R. 14 W.

A11—0 to 9 inches; black (10YR 2/1) fine sandy loam; weak fine granular structure; friable; slightly acid; clear smooth boundary.

A12—9 to 13 inches; very dark gray (10YR 3/1) fine sandy loam; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

B1—13 to 18 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; very friable; very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B21—18 to 27 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to weak medium subangular blocky; friable; patchy dark grayish brown (10YR 4/2) coatings on ped faces; slightly acid; clear smooth boundary.

B22—27 to 33 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles and many fine distinct gray (5Y 5/1) mottles; weak fine prismatic structure parting to

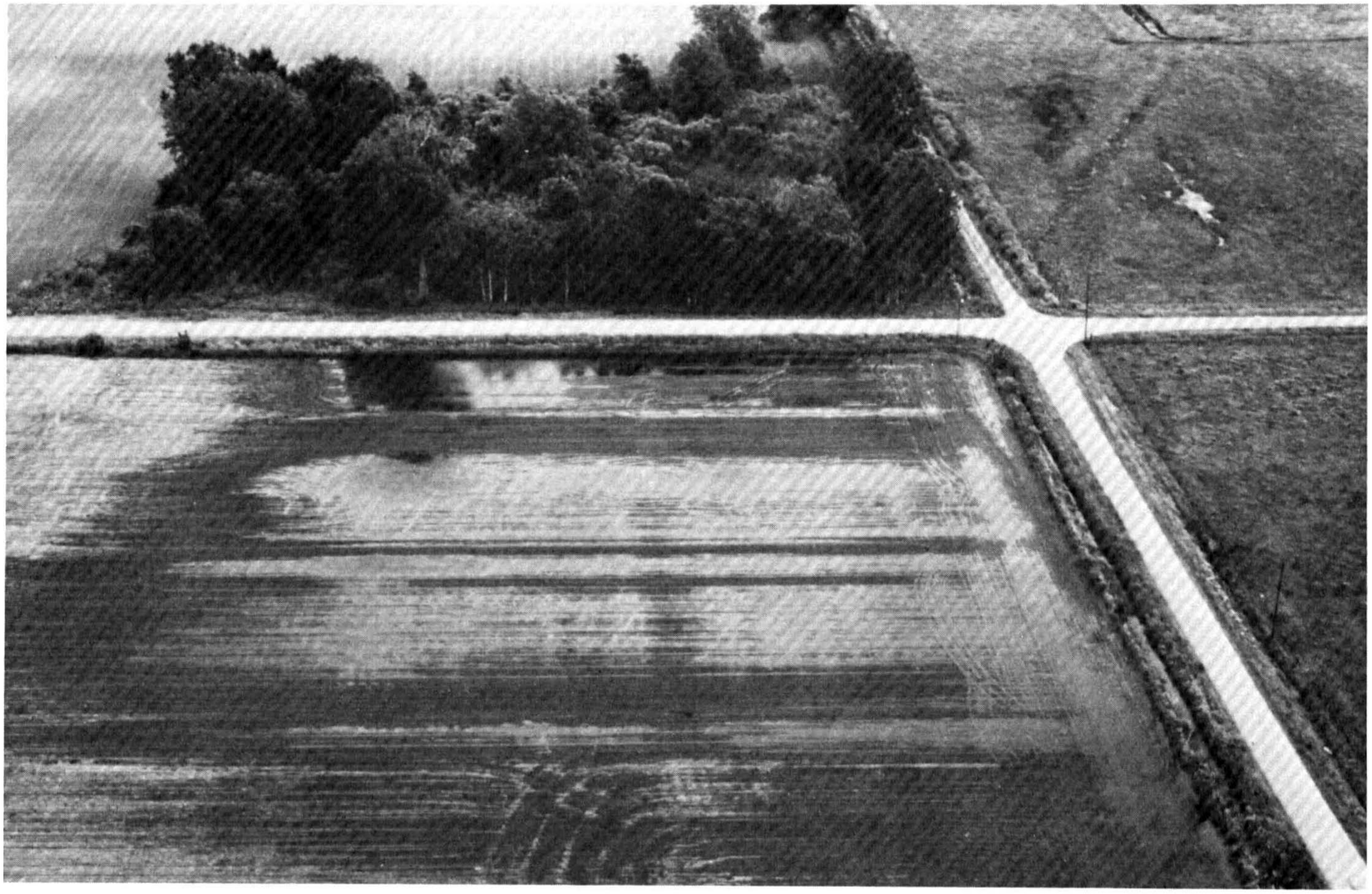

Figure 5.—Gilford fine sandy loam that has ponded.

moderate medium subangular blocky; friable; patchy dark gray (10YR 4/1) coatings on ped faces; neutral; clear smooth boundary.

B3—33 to 46 inches; grayish brown (10YR 5/2) stratified fine sandy loam, loamy fine sand, and silt loam; weak medium prismatic structure parting to weak medium and coarse subangular blocky; friable; discontinuous dark gray (10YR 4/1) coatings on vertical ped faces; neutral; gradual wavy boundary.

C—46 to 60 inches; gray (5Y 5/1) stratified fine sandy loam, loamy fine sand, and silt loam; many coarse prominent yellowish brown (10YR 5/4) mottles; single grained; very friable; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 18 inches in thickness. It is black and very dark gray fine sandy loam that ranges to loam or loamy fine sand. The B horizon ranges from dark grayish brown and grayish brown to brown. The subhorizons that have brown matrix color have grayish brown mottles. The B horizon is dominantly fine sandy loam, but in places it ranges to sandy clay loam or loamy fine sand. The C horizon is variable, stratified glacial outwash material that ranges from fine sand to silt loam.

Hoopeston soils are associated with Ade, Onarga, and Gilford soils. Hoopeston soils are more poorly drained than Ade and Onarga soils and better drained than Gilford soils.

172—Hoopeston fine sandy loam. This is a nearly level soil in irregularly shaped areas that are somewhat higher than the flat surrounding areas.

Included with this soil in mapping are small areas of Gilford fine sandy loam and Watseka loamy fine sand. Also included are areas where the surface layer is thinner than is described as representative of the series.

This soil is well suited to the crops commonly grown in the county. Droughtiness is a problem in some seasons because this soil has moderate available water capacity. In spring a high water table is frequently a limitation. Many areas need artificial drainage for cultivation early in spring. Drainage should be provided as needed by tiles or open ditches. Management practices that increase organic-matter content and prevent soil blowing help to increase the productivity of this soil. Management group IIs-2.

Jasper Series

The Jasper series consists of nearly level to gently sloping, well drained soils in the higher lying, better drained glacial outwash areas. These soils formed in medium textured glacial outwash material. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark grayish brown silt loam about 15 inches thick. The subsoil is about 30 inches thick. In the upper 7 inches it is dark yellowish brown heavy silt loam; in the middle 16 inches it is dark yellowish brown and dark brown clay loam; and in the lower 7 inches it is brown loam. The underlying material is stratified, dark yellowish brown sandy loam and sand. It is slightly acid to neutral glacial outwash.

Permeability is moderate, and the available water capacity is high. The organic-matter content is moderate.

Jasper soils are well suited to all the commonly grown crops. They are used intensively for corn and soybeans. Increasing the organic-matter content and protecting sloping areas from erosion are the main concerns of management.

Representative profile of Jasper silt loam, 0 to 2 percent slopes, 72 feet north and 2,388 feet east of the southwest corner of sec. 2, T. 31 N., R. 13 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam that has a high sand content; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

A12—10 to 15 inches; very dark grayish brown (10YR 3/2) silt loam that has a high sand content; moderate fine granular structure; friable; discontinuous black (10YR 2/1) coatings on ped faces; slightly acid; clear smooth boundary.

B1—15 to 22 inches; dark yellowish brown (10YR 4/4) silt loam that has a high sand content; moderate very fine subangular blocky structure; friable; continuous very dark grayish brown (10YR 3/2) coatings on ped faces; strongly acid; clear smooth boundary.

B21t—22 to 32 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; firm; dark yellowish brown (10YR 3/4) coatings on ped faces; strongly acid; clear smooth boundary.

B22t—32 to 38 inches; dark brown (7.5YR 4/4) clay loam that has common gravel; moderate medium subangular blocky structure; firm; dark brown (10YR 3/3) coatings on ped faces; strongly acid; clear smooth boundary.

B3—38 to 45 inches; brown (10YR 5/3) loam; weak medium subangular blocky structure; friable; dark brown (10YR 3/3) coatings on ped faces; strongly acid; gradual wavy boundary.

IIC—45 to 60 inches; dark yellowish brown (10YR 4/4) stratified sandy loam and sand; single grained; loose; slightly acid to neutral.

The A horizon ranges from 10 to 15 inches in thickness. It is black and very dark grayish brown silt loam to light loam. The B horizon ranges from heavy silt loam that has a high sand content to loam, clay loam, and silty clay loam. The C horizon is loamy or sandy stratified glacial outwash material that has a variable stone content.

Jasper soils are associated with Darroch and Selma soils. Jasper soils are better drained and are in a higher position on the landscape than Darroch and Selma soils.

440A—Jasper silt loam, 0 to 2 percent slopes. This is a nearly level soil in areas that are somewhat higher than the surrounding flat areas. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Darroch silt loam. Also included are small areas where glacial till, bedrock, or rubble is at a depth of 45 to 60 inches.

This soil is very well suited to the crops commonly grown in the county. It can be cropped intensively. Management group I-1.

440B—Jasper silt loam, 2 to 4 percent slopes. This is a gently sloping soil on small rises or on short side slopes surrounded by more poorly drained, nearly level soils. It has a profile similar to the one described as representative of the series, but the surface layer is thinner.

Included with this soil in mapping are small areas of Jasper silt loam, 0 to 2 percent slopes, and areas of eroded soils. Also included are small areas where glacial till, bedrock, or rubble is at a depth of 45 to 60 inches.

This soil is suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. The size and shape of the areas of soil limit the use of some erosion control practices. Contouring and conservation tillage help to reduce soil losses. Management group IIe-1.

Kankakee Series

The Kankakee series consists of nearly level to gently sloping, moderately well drained and well drained soils on high-lying glacial outwash plains. These soils formed in loamy material and the underlying cobbly material. The native vegetation was prairie grasses.

In a representative profile the surface layer is very dark gray fine sandy loam about 9 inches thick. The subsoil is 18 inches thick. In the upper 12 inches it is brown and yellowish brown fine sandy loam and sandy clay loam, and in the lower 6 inches it is brownish yellow, very cobbly loam that is moderately alkaline. The underlying material is moderately alkaline, brownish yellow and very pale brown, very cobbly fine sandy loam. The cobbles are dominantly somewhat rounded limestone that averages 4 to 6 inches in diameter.

Permeability is moderately rapid, and the available water capacity is moderate. The organic-matter content is moderate.

Nearly level and gently sloping Kankakee soils are used intensively for corn and soybeans. These soils are also suited to the other commonly grown crops.

Representative profile of Kankakee fine sandy loam, 0 to 2 percent slopes, 1,575 feet north and 110 feet east of the southwest corner of sec. 36, T. 31 N., R. 10 E.

Ap—0 to 6 inches; very dark gray (10YR 3/1) fine sandy loam; weak fine granular structure; friable; neutral; abrupt smooth boundary

A12—6 to 9 inches; very dark gray (10YR 3/1) fine sandy loam; weak fine granular structure; friable; neutral; clear smooth boundary.

B1—9 to 14 inches; brown (10YR 4/3) fine sandy loam; weak very fine and fine subangular blocky structure; friable; continuous very dark grayish brown (10YR 3/2) coatings on ped faces; neutral; clear smooth boundary.

B2t—14 to 21 inches; yellowish brown (10YR 5/6) sandy clay loam; weak fine and medium subangular blocky structure; friable; discontinuous dark brown (10YR 4/3) coatings on ped faces; neutral; gradual wavy boundary.

IIB3—21 to 27 inches; brownish yellow (10YR 6/8) very cobbly loam; weak medium subangular blocky structure; friable; discontinuous dark brown (10YR 4/3) coatings on ped faces; slightly effervescent; moderately alkaline; gradual wavy boundary.

IIC—27 to 60 inches; brownish yellow (10YR 6/8) and very pale brown (10YR 7/4) very cobbly fine sandy loam; single grained; very friable; strongly effervescent; moderately alkaline.

The A horizon ranges from 6 to 14 inches in thickness. It is black to dark brown fine sandy loam or loam. The B horizon is dominantly loam, sandy clay loam, or clay loam, but in the lower part it is cobbly or very cobbly fine sandy loam. The depth to the cobbly material ranges from 15 to 40 inches. The C horizon ranges from a few feet to more than 20 feet in thickness. The size and percentage of cobbles in the matrix varies in relation to the distance from the primary source of the limestone.

Kankakee soils are associated with Bonfield and Fieldon soils. Kankakee soils are better drained than these soils.

494A—Kankakee fine sandy loam, 0 to 2 percent slopes. This is a nearly level soil in irregularly shaped areas that are in the somewhat higher, better drained positions on the landscape. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Bonfield loam and small areas where the cobbles are below a depth of 40 inches. Also included are small areas where some cobbles are in the surface layer.

This soil is suited to the crops commonly grown in the county. Periods of moisture deficiency occur because the soil has only moderate available water capacity. If good management and conservation tillage are used to protect it from soil blowing, this soil can be farmed intensively. Management group IIs-1.

494B—Kankakee fine sandy loam, 2 to 4 percent slopes. This is a gently sloping soil that is associated with Bonfield loam and Kankakee fine sandy loam, 0 to 2 percent slopes. It has a profile similar to the one described as representative of the series but tends to have the cobbly material at a shallower depth.

Included with this soil in mapping are small areas of steeper, eroded soils and small areas where the cobbly material is at a depth of less than 15 inches. Areas of eroded soils and very cobbly soils are indicated on the soil map by conventional symbols.

This soil is suited to the crops commonly grown in the county. Periods of moisture deficiency occur because the soil has only moderate available water capacity. Conservation tillage is needed to control soil blowing. Management group IIs-1.

Lena Series

The Lena series consists of very poorly drained, calcareous, nearly level and gently sloping organic soils on seepy hillsides or in low-lying depressions. These soils formed in fibrous plant remains in swampy areas that have a high concentration of snail shells. The native vegetation was reeds, sedges, and swamp grasses.

In a representative profile the upper 26 inches of the soil is black muck that has common snail shells. The next 46 inches is black muck that has few snail shells and more fibrous material. The underlying material is gray, stratified silt and sand.

Permeability is moderately rapid, and the available water capacity is high. The organic-matter content is very high.

If adequately drained and fertilized, Lena soils are suited to corn and soybeans. Areas that are too wet to cultivate are in pasture, are left idle, or provide cover for wildlife.

Representative profile of Lena muck, 525 feet east and 1,825 feet south of the northwest corner of sec. 3 (175 feet south of quonset barn), T. 31 N., R. 14 E.

Oa1—0 to 26 inches; black (N 2/0) broken faced and rubbed sapric material; about 5 to 15 percent fiber, a trace when rubbed; weak medium granular structure; friable; common snail shell fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

Oa2—26 to 42 inches; black (N 2/0) broken faced and rubbed sapric material; about 15 percent fiber; very weak medium and coarse subangular blocky structure; few snail shell fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

Oa3—42 to 72 inches; black (N 2/0) and dark brown (7.5YR 3/2) broken faced and rubbed sapric material; about 15 to 20 percent fiber; massive; few snail shell fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

IIC—72 to 86 inches; gray (5Y 5/1) stratified silt and sand; massive; slightly effervescent; moderately alkaline.

The sapric material is 51 to more than 100 inches thick. Hemic, or undecomposed, layers vary in occurrence and make up only a small part of the profile. The amount of snail shells or fragments varies throughout the profile. In most areas they are more numerous in the upper part of the profile.

Lena soils are similar to Palms soils, but are calcareous throughout and have more than 51 inches of organic material.

210—Lena muck. This is a nearly level to gently sloping soil in seepy areas along the base of hills and in low-lying depressional areas that were formerly swamps. Slope is 0 to 4 percent.

Included with this soil in mapping are small areas of recent overwash and small areas where the organic material is less than 51 inches thick. Swampy areas are shown on the soil map by conventional symbols.

The suitability of this soil for crops is limited. It is difficult to drain, and the high carbonate level causes some phosphates to become less available to plants. Management group IIIw-2.

Markham Series

The Markham series consists of nearly level to moderately sloping, moderately well drained and well drained soils in the more rolling glacial till areas. These soils formed in thin deposits of silty material and the underlying glacial till. The native vegetation was mixed hardwood trees and prairie grasses.

In a representative profile the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is yellowish brown silty clay loam and silty clay, and the lower part is yellowish brown silty clay loam that has grayish brown mottles. The lower 5 inches of the subsoil is moderately alkaline. The underlying material is grayish brown and yellowish brown, calcareous, silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is moderate.

Most areas of Markham soils are suited to cropping, but the severely eroded Markham soils in moderately sloping areas are only suited to limited cropping. Controlling erosion and increasing the organic-matter content are the main concerns of management.

Representative profile of Markham silt loam, 1 to 4 percent slopes, 10 feet east and 2,588 feet south of the northwest corner of sec. 8, T. 32 N., R. 15 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; moderate very fine granular structure; friable; medium acid; abrupt smooth boundary.

A2—7 to 10 inches; brown (10YR 5/3) silt loam; moderate fine granular structure; friable; strongly acid; clear smooth boundary.

B21t—10 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (10YR 4/2) clay films on ped faces; medium acid; clear smooth boundary.

B22t—20 to 28 inches; yellowish brown (10YR 5/4) light silty clay; many fine faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; dark grayish brown (10YR 4/2) clay films on ped faces; strongly acid; clear smooth boundary.

B23t—28 to 34 inches; yellowish brown (10YR 5/4) heavy silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; discontinuous dark grayish brown (10YR 4/2) clay films on ped faces; slightly acid; clear smooth boundary.

B3—34 to 39 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; discontinuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) coatings on ped faces; slightly effervescent; moderately alkaline; clear smooth boundary.

C—39 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to massive; firm; strongly effervescent; moderately alkaline.

The Ap horizon ranges from 7 to 9 inches in thickness. It is very dark grayish brown or very dark gray silt loam to silty clay. The B horizon is dominantly silty clay loam and silty clay but in places is clay loam. Some places have no A2 horizon.

Markham soils are associated with Beecher, Morley, Varna, Elliott, and Ashkum soils. Markham soils have a darker colored Ap horizon than Morley soils and have an A2 horizon that is lacking in Varna soils. They are better drained than Beecher, Elliott, and Ashkum soils.

531B—Markham silt loam, 1 to 4 percent slopes. This is a nearly level to gently sloping soil on narrow ridges or on short side slopes that are surrounded by flat, more poorly drained soils. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Beecher silt loam, 0 to 2 percent slopes, and Morley silt loam, 2 to 4 percent slopes. Also included are areas of eroded soils.

This soil is well suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. The size and shape of the areas of soil limit the use of some erosion-control practices. Contour farming and conservation tillage help to control erosion. Management group IIe-3.

531C2—Markham silt loam, 4 to 7 percent slopes, eroded. This is a moderately sloping soil in somewhat elongated areas on the sides of drainageways. It has a profile similar to the one described as representative of the series but has a thinner surface layer. In most areas material from the subsoil has been mixed with the surface layer.

Included with this soil in mapping are small areas of Markham soils, 4 to 7 percent slopes, severely eroded, and small areas of Markham silt loam, 1 to 4 percent slopes. Also included are small areas of Morley silt loam, 4 to 10 percent slopes, and small areas where slopes are more than 7 percent.

This soil is suited to the crops commonly grown in the county, but it is subject to severe erosion if cropped. Contouring, terracing, or conservation tillage are needed to control erosion. Management group IIIe-1.

531C3—Markham soils, 4 to 7 percent slopes, severely eroded. This mapping unit is on the sides of large drainageways or at the head of watersheds in the moraine area. It has a profile similar to the one described as representative of the series, but the surface layer consists mostly, or entirely, of subsoil material and ranges from silt loam to silty clay. The organic-matter content is low.

Included with this unit in mapping are small areas where the surface layer includes only small amounts of subsoil material. Also included are small areas of Morley soils, 5 to 12 percent slopes, severely eroded, and areas that have steeper slopes.

These soils are suited to only limited row crops. They are better suited to small grain or meadow crops. Erosion has been and will continue to be severe if these soils are farmed without the use of erosion-control practices. Management group IVe-1.

Martinton Series

The Martinton series consists of nearly level, somewhat poorly drained soils in glacial lakebeds and on ground moraines. These soils formed in waterlaid deposits that are mainly silty clay loam and are stratified in the lower part. The native vegetation was prairie grasses.

In a representative profile the surface layer is 13 inches thick. In the upper 10 inches it is black heavy silt loam, and in the lower 3 inches it is very dark gray light silty clay loam. The subsoil is about 24 inches thick. In sequence from the top it is 5 inches of dark grayish brown silty clay loam, 13 inches of grayish brown light silty clay that has yellowish brown mottles, and 6 inches of grayish brown silty clay loam that has yellowish brown mottles. The underlying material is stratified, gray silty clay loam and loam to a depth of 45 inches. Below this it is gray silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Martinton soils are well suited to all commonly grown crops.

Representative profile of Martinton silt loam, 42 feet south and 1,970 feet east of the northwest corner of sec. 2, T. 31 N., R. 12 E.

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

A3—10 to 13 inches; very dark gray (10YR 3/1) light silty clay loam; moderate medium granular structure; friable; neutral; clear smooth boundary.

B21t—13 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct yellowish brown (10YR 5/4) mottles; moderate fine prismatic structure parting to moderate very fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B22t—18 to 24 inches; grayish brown (10YR 5/2) light silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate very fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; neutral; clear smooth boundary.

B23t—24 to 31 inches; grayish brown (10YR 5/2) light silty clay; many medium distinct yellowish brown mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on ped faces; neutral; gradual smooth boundary.

B3—31 to 37 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; mildly alkaline; gradual wavy boundary.

C1—37 to 45 inches; gray (5Y 5/1) stratified silty clay loam and loam; many coarse prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; slightly effervescent; moderately alkaline; clear smooth boundary.

IIC2—45 to 60 inches; gray (5Y 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; massive; firm; common till pebbles; strongly effervescent; moderately alkaline.

The solum ranges from 30 to 45 inches in thickness in most places. Depth to glacial till is 4 to 5 feet in most places. The A horizon ranges from 10 to 15 inches in thickness. It is silt loam and silty clay loam. The B horizon is silty clay loam and silty clay. It is brown to grayish brown and has variable amounts of yellowish brown and gray mottles. The lower part of the B horizon and the C horizon are dominantly silty clay loam but include strata of loam, sandy loam, and silty clay.

Martinton soils are associated with Milford soils. Martinton soils are better drained and are in higher positions on the landscape than Milford soils.

189—Martinton silt loam. This is a nearly level soil in irregularly shaped, small, slightly elevated areas on the landscape. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Milford silty clay loam and Beecher silt loam. Also included are some areas where glacial till material is not within 5 feet of the surface.

A seasonal high water table and the moderately slow permeability are limitations to the use of this soil. Some areas that are to be cultivated early in spring need artificial drainage. Random tile lines of shallow surface ditches improve drainage. Management group IIw-3.

Maumee Series

The Maumee series consists of nearly level, poorly drained soils in large, low-lying to depressional areas on broad outwash plains. These soils formed in sandy glacial outwash material. The native vegetation was swamp grasses, reeds, and sedges.

In a representative profile the surface layer is black loamy fine sand about 18 inches thick. The subsoil is light brownish gray fine sand about 8 inches thick. The underlying material is gray fine sand.

Permeability is very rapid, and the available water capacity is low. The organic-matter content is high.

Maumee soils are farmed intensively, but management is needed to maintain the level of soil moisture and fertility necessary for sustained high production.

Representative profile of Maumee loamy fine sand, 55 feet north and 1,746 feet west of the southeast corner of sec. 18, T. 30 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) loamy fine sand; weak medium granular structure; very friable; neutral; abrupt smooth boundary.

A12—8 to 18 inches; black (10YR 2/1) loamy fine sand; weak medium granular structure; very friable; medium acid; clear smooth boundary.

B2—18 to 26 inches; light brownish gray (2.5Y 6/2) fine sand; common medium prominent yellowish brown (10YR 5/4 and 5/6) mottles; single grained: loose; patchy dark gray (10YR 4/1) and very dark gray (10YR 3/1) stains; medium acid; clear wavy boundary.

C1—26 to 36 inches; gray (N 5/1) fine sand; common medium prominent yellowish brown (10YR 5/8) mottles; single grained; loose; neutral; gradual wavy boundary.

C2—36 to 60 inches; gray (N 5/0) and dark gray (2.5Y 4/0) fine sand; few medium prominent yellowish brown (10YR 5/8) mottles; single grained; loose; mildly alkaline.

The A horizon ranges from 10 to 20 inches in thickness. It is black and very dark gray loamy fine sand. The B horizon has variable gray colors and mottles. It is commonly fine sand but has some thin strata of loamy fine sand. The C horizon is fine or medium sand that is dominantly gray.

Maumee soils are associated with Watseka, Sparta, and Oakville soils. Maumee soils are more poorly drained and have a thicker dark-colored A horizon than those soils.

89—Maumee loamy fine sand. This is a nearly level soil in flat or depressional areas.

Included with this soil in mapping are small areas of Watseka loamy fine sand and Gilford fine sandy loam. Also included are small areas where soil blowing has thinned or thickened the dark-colored surface layer. Wet areas, marshy areas, and areas of bog iron concentration are indicated on the soil map by conventional symbols.

If good management practices are used, this soil is suited to the crops commonly grown in the county. A seasonal high water table, the low available water capacity and natural fertility, and the hazard of soil blowing are serious limitations to use. Open surface ditches with water control structures, where needed, help to control the moisture supplied to crops. Most areas need artificial drainage for cultivation early in spring. Conservation tillage is needed to control soil blowing. Management group IIIw-1.

Milford Series

The Milford series consists of nearly level, poorly drained soils in glacial lakebeds and on ground moraines. These soils formed in glacial sediment that is mainly silty clay loam and is stratified in the lower part. The native vegetation was prairie grasses adapted to swampy conditions.

In a representative profile the surface layer is black silty clay loam about 16 inches thick. The subsoil is about 31 inches thick. In the upper 6 inches it is very dark grayish brown heavy silty clay loam; in the middle 19 inches it is dark grayish brown and dark gray silty clay; and in the lower 6 inches it is dark gray silty clay loam. The underlying material is stratified, gray silty clay loam separated by thin lenses of silt and sandy loam. It has yellowish brown mottles. It is moderately alkaline glacial lakebed sediment.

Permeability is moderately slow, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Milford soils are also well suited to the other commonly grown crops.

Representative profile of Milford silty clay loam, 38 feet north and 10 feet west of the southeast corner of sec. 12, T. 32 N., R. 11 E.

Ap—0 to 10 inches; black (N 2/0) silty clay loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A12—10 to 16 inches; black (10YR 2/1) silty clay loam; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

B1g—16 to 22 inches; very dark grayish brown (2.5Y 3/2) heavy silty clay loam; few fine faint olive brown (2.5Y 4/4) mottles; moderate very fine subangular blocky structure; firm; very dark gray (N 3/0) coatings on ped faces; slightly acid; clear smooth boundary.

B21g—22 to 31 inches; dark grayish brown (2.5Y 4/2) light silty clay; common fine faint yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; dark gray (N 4/0) coatings on ped faces; neutral; clear wavy boundary.

B22g—31 to 41 inches; dark gray (5Y 4/1) light silty clay; many light olive brown (2.5Y 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; dark gray (N 4/0) coatings on ped faces, neutral; clear wavy boundary.

B3g—41 to 47 inches; dark gray (5Y 4/1) silty clay loam that has thin lenses and small pockets of fine sandy loam; many fine and medium distinct light olive brown (2.5Y 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; dark grayish brown (2.5Y 4/2) coatings on ped faces; neutral; clear smooth boundary.

C—47 to 71 inches; gray (N 5/0) silty clay loam that has thin lenses of silt and sandy loam; many coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse subangular blocky structure grading to massive; firm; slightly effervescent; moderately alkaline.

The solum ranges from 40 to 55 inches in thickness. The A horizon ranges from 12 to 18 inches in thickness. The B2 horizon is silty clay loam and silty clay and has the heaviest textured material in the upper part. It is dark grayish brown to gray and has dominantly yellowish brown mottles. The B3 horizon ranges from heavy silty clay loam to clay loam and is commonly stratified. The C horizon is dominantly silty clay loam but includes variable stratified textures.

Milford soils are associated with Martinton soils and are poorly drained like Bryce and Ashkum soils. Milford soils are more poorly drained than Martinton soils and have more clay in the A horizon. Milford soils have less clay throughout the profile than Bryce soils. They are similar to Ashkum soils in texture of the solum, but Ashkum soils formed in moderately fine textured glacial till and lack stratification in the lower part of the B horizon and in the C horizon.

69—Milford silty clay loam. This is a nearly level soil in broad, irregularly shaped areas; to a lesser extent, it occupies long glacial drainage outlets in the ground moraine.

Included with this soil in mapping are small areas of Ashkum silty clay loam and Bryce silty clay. Also included are small areas of overwash material. Wet areas, calcareous areas, and gray spots are shown on the soil map by conventional symbols.

This soil is well suited to crops commonly grown in the county if it is adequately drained. A seasonal high water table and the moderately slow permeability are limitations for some uses. Many areas that are to be cultivated early in spring need artificial drainage. Tile drains or shallow open ditches improve drainage. Management group IIw-2.

Mokena Series

The Mokena series consists of nearly level, somewhat poorly drained soils on small ridges in more rolling areas and on slight elevations in large, nearly level areas. These soils formed in loamy glacial outwash material and the underlying glacial drift. The native vegetation was prairie grasses.

In a representative profile the surface layer is black loam about 15 inches thick. The subsoil is about 29 inches thick. In the upper 7 inches it is dark grayish brown loam; in the middle 10 inches it is mottled brown clay loam; and in the lower 12 inches it is greenish gray silty clay that has yellowish brown mottles. The underlying material is compact, calcareous, greenish gray silty clay that has yellowish brown mottles.

Permeability is moderately slow, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Mokena soils are well suited to these and other commonly grown crops.

Representative profile of Mokena loam, 60 feet east and 2,005 feet south of the northwest corner of sec. 7, T. 29 N., R. 12 W.

Ap—0 to 7 inches; black (10YR 2/1) loam; weak fine and medium granular structure; friable; mildly alkaline; abrupt smooth boundary.

A12—7 to 15 inches; black (10YR 2/1) loam; weak fine granular structure; friable; neutral; clear smooth boundary.

B1—15 to 22 inches; dark grayish brown (10YR 4/2) loam; few fine faint yellowish brown (10YR 5/4) mottles; weak very fine subangular blocky structure; friable; very dark gray (10YR 3/1) coatings on ped faces; clear smooth boundary.

B21t—22 to 28 inches; brown (10YR 5/3) light clay loam; few fine faint yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to weak very fine subangular blocky; friable; dark grayish brown (10YR 4/2) coatings on ped faces; neutral; clear smooth boundary.

B22t—28 to 32 inches; brown (10YR 5/3) clay loam; many medium faint yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on vertical ped faces; neutral; clear smooth boundary.

IIB31—32 to 37 inches; greenish gray (5GY 5/1) heavy silty clay loam that has a high sand content; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on vertical ped faces; slightly effervescent; moderately alkaline; clear smooth boundary.

IIB32—37 to 44 inches; greenish gray (5GY 5/1) silty clay; many coarse prominent yellowish brown (10YR 5/6) mottles; weak prismatic structure parting to moderate fine subangular blocky; very firm; strongly effervescent; moderately alkaline; gradual wavy boundary.

IIC—44 to 60 inches; greenish gray (5GY 5/1) silty clay; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; very firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 16 inches in thickness. It is black to very dark grayish brown loam or silt loam that has variable amounts of sand. The B horizon is loam, clay loam, or silty clay loam in the upper part and silty clay to clay in the lower part. The C horizon is calcareous, silty clay to clay glacial drift.

Mokena soils are associated with Frankfort and Bryce soils. Mokena soils are better drained than Bryce soils. They are coarser textured in the upper part of the solum than Bryce and Frankfort soils.

295—Mokena loam. This is a nearly level soil in irregularly shaped areas on glacial moraines or in glacial lakebeds. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Frankfort silt loam, 0 to 2 percent slopes, and Bryce silty clay. Also included are areas where the overburden of loamy and sandy material is thicker than is described as representative of the series and areas of gently sloping soils. Sandy areas, gray spots, and wet spots are shown on the soil map by conventional symbols.

This soil is suited to the crops commonly grown in this county. A seasonal high water table and the moderately slow permeability are somewhat severe limitations to use. Some areas need artificial drainage for cultivation early in spring. Tile drains improve drainage where needed. Management group IIw-3.

Morley Series

The Morley series consists of gently sloping to steep, moderately well drained and well drained soils mainly along the major streams and in the more rolling areas of the glacial moraines. These soils formed in thin deposits of silty material and the underlying glacial till. The native vegetation was hardwood trees.

In a representative profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. In sequence from the top it is 3 inches of brown heavy silt loam, 18 inches of yellowish brown silty clay loam, 7 inches of brown silty clay, and 7 inches of brown silty clay loam. The lower 15 inches is mottled. The underlying material is brown, calcareous, silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is moderate.

Less than half the acreage is used for crops. Only the small acreage of gently sloping soils is suited to crops year after year. Areas that are in woodland or pasture should remain in this use. Controlling erosion in cultivated areas is the main concern of management.

Representative profile of Morley silt loam, 2 to 4 percent slopes, 200 feet north and 975 feet east of the southwest corner of sec. 19, T. 31 N., R. 12 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 11 inches; brown (10YR 5/3) heavy silt loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—11 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; dark yellowish brown (10YR 4/4) coatings on ped faces; strongly acid; clear smooth boundary.

B22t—17 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; strongly acid; clear smooth boundary.

B23t—29 to 36 inches; brown (10YR 5/3) silty clay; common fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on ped faces; medium acid; clear wavy boundary.

B3—36 to 43 inches; brown (10YR 5/3) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; very dark grayish brown (10YR 3/2) coatings on ped faces; slightly acid; gradual wavy boundary.

C—43 to 60 inches; brown (10YR 5/3) silty clay loam; massive; firm; strongly effervescent: moderately alkaline.

The A horizon is 8 to 13 inches thick. A thin A2 horizon occurs in uncultivated areas. The A horizon is grayish brown and dark grayish brown silt loam or silty clay loam. The B2 and B3 horizons are dominantly silty clay loam and silty clay but clay loam is within the range. The B horizon is yellowish brown and brown to light olive brown.

Morley soils are associated with Beecher and Markham soils. Morley soils are lighter colored than both these soils. They are better drained than Beecher soils.

194B—Morley silt loam, 2 to 4 percent slopes. This soil is on ridges or short side slopes in the higher lying positions on the landscape. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Markham silt loam, 1 to 4 percent slopes, and Beecher silt loam, 2 to 4 percent slopes. Also included are areas where the surface layer is thinner than is described as representative of the series.

This soil is well suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. The size and shape of the areas of soil limit the use of some erosion-control practices. Contour farming and conservation tillage help to control erosion. Management group IIe-3.

194C—Morley silt loam, 4 to 10 percent slopes. This soil is on short, irregularly shaped side slopes that are commonly adjacent to more rolling soils in woodland or pasture. It has a profile similar to the one described as representative of the series but has a thicker surface layer. Included in mapping are small areas of eroded soils and small areas where the surface layer is darker than is described as representative of the series.

This soil is suited to the crops commonly grown in the county. Because of their size and location, however, areas in woodland or pasture should remain in that use. Management group IIIe-1.

194C3—Morley soils, 5 to 12 percent slopes, severely eroded. This mapping unit is at the head or on the sides of drainageways in the more rolling areas of moraines. The surface layer consists mostly, or entirely, of subsoil material and ranges from silty clay loam to silt loam. The organic-matter content is low.

Included with this unit in mapping are small areas where only a small amount of subsoil material has been mixed with the surface layer. Also included are small areas of Morley soils that have steeper slopes.

These soils are suited to only limited use for row crops. They are better suited to small grain or meadow crops. Erosion has been and will continue to be severe if these soils are farmed without the use of erosion-control practices. Management group IVe-1.

194E2—Morley silt loam, 12 to 25 percent slopes, eroded. This soil is on long, narrow breaks between the glacial uplands and the drainageways of the streams and the valley. It has a profile similar to the one described as representative of the series, but in most places the surface layer and subsoil are thinner. The organic-matter content is low. Included in mapping are many areas of soils that are not eroded and a few small areas of soils that are severely eroded.

This soil is suited to pasture or woodland. Woodland areas should be maintained and protected from fire and grazing. In places woodland or grassland needs to be established for soil protection. Erosion can be a serious limitation to any use. Management group VIe-1.

Morocco Series

The Morocco series consists of nearly level, somewhat poorly drained soils on broad outwash plains. These soils formed in sandy glacial outwash material. Areas are variable in size. The native vegetation was hardwood trees and bushes.

In a representative profile the surface layer is very dark grayish brown fine sand. The subsurface layer is mottled brown fine sand. The subsoil is mottled light yellowish brown and very pale brown fine sand about 30 inches thick. The underlying material is light yellowish brown and yellowish brown fine sand.

Permeability is rapid, and the available water capacity is low. The organic-matter content is low.

Morocco soils are not farmed intensively. Most areas are left idle or are in trees or water-tolerant grasses. Where they are farmed, these soils need special management to conserve water, increase fertility, and prevent soil blowing.

Representative profile of Morocco fine sand, 807 feet east and 87 feet north of the southwest corner of sec. 6, T. 29 N., R. 10 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) fine sand; weak fine granular structure parting to single grained; very friable; slightly acid; abrupt smooth boundary.

A2—4 to 10 inches; brown (10YR 5/3) fine sand; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure parting to single grained; loose; dark grayish brown (10YR 4/2) stains; medium acid; clear smooth boundary.

B21—10 to 17 inches; light yellowish brown (10YR 6/4) fine sand; many coarse distinct yellowish brown (10YR 5/6) mottles and many coarse faint grayish brown (10YR 5/2) mottles; single grained; loose; discontinuous dark grayish brown (10YR 4/2) stains; strongly acid; clear smooth boundary.

B22—17 to 40 inches; very pale brown (10YR 7/3 and 7/4) fine sand; common to many coarse distinct yellowish brown (10YR 5/8) mottles; single grained; loose; slightly acid; gradual wavy boundary.

C—40 to 60 inches; light yellowish brown (10YR 6/4) fine sand; many medium distinct yellowish brown (10YR 5/6) mottles; single grained; loose; slightly acid.

The A horizon ranges from 6 to 16 inches in thickness. It is grayish brown and brown to very dark grayish brown fine sand or loamy fine sand. The B horizon is mottled light yellowish brown or very pale brown to gray fine sand and loamy fine sand. The C horizon is fine sand or loamy fine sand that is variable in color.

Morocco soils are associated with Oakville, Watseka, and Maumee soils and, to a lesser extent, with Chelsea and Gilford soils. Morocco soils are better drained and lighter colored than Maumee and Gilford soils. They are not so well drained as Oakville and Chelsea soils. They lack the thick, dark colored surface layer of Watseka soils.

501—Morocco fine sand. This is a nearly level soil that is somewhat higher lying than Maumee soils and lower than Oakville soils.

Included with this soil in mapping are small areas of Watseka loamy fine sand and Oakville fine sand, 1 to 6 percent slopes. Also included are small areas where the soil is more poorly drained than is typical of the series and small areas where finer textured strata are in the subsoil.

If special management is used to conserve soil water and fertility and control erosion, this soil is suited to the crops commonly grown in the county. If cropped, it is better suited to small grains than to other crops. A seasonal high water table, the low available water capacity and natural fertility, and the hazard of soil blowing are severe limitations to use. Management group IVs-1.

Oakville Series

The Oakville series consists of gently sloping to very steep, excessively drained soils in higher and better drained positions on the landscape. Most areas are prominent, tree-covered, somewhat elongated, sandbarlike ridges. These soils formed in sandy glacial outwash material. The native vegetation was hardwood trees.

In a representative profile the surface layer is dark brown fine sand about 7 inches thick. The subsoil is yellowish brown fine sand about 33 inches thick. The underlying material is light yellowish brown and very pale brown fine sand.

Permeability is very rapid, and the available water capacity is low. The organic-matter content is low.

Oakville soils are better suited to trees than to other uses. If these soils are not protected by a plant cover, droughtiness and severe soil blowing are limitations to use.

Representative profile of Oakville fine sand, 1 to 6 percent slopes, 1,840 feet south and 40 feet east of the northwest corner of sec. 24, T. 30 N., R. 12 W.

A1—0 to 7 inches; dark brown (10YR 4/3 and 3/3) fine sand; very weak fine granular structure parting to single grained; loose; very strongly acid; clear smooth boundary.

B2—7 to 40 inches; yellowish brown (10YR 5/6) fine sand; single grained; loose; very strongly acid; clear smooth boundary.

C—40 to 65 inches; light yellowish brown (10YR 6/4) and very pale brown (10YR 7/4) fine sand; single grained; loose; strongly acid.

The A horizon ranges from 5 to 9 inches in thickness. It is very dark grayish brown to dark brown. An A2 horizon occurs in places. The C horizon in places contains thin, darker colored bands or lamellae.

741B—Oakville fine sand, 1 to 6 percent slopes. This is a nearly level to moderately sloping soil on broad ridges that are higher than the surrounding, more poorly drained soils. It has the profile described as representative of the series. In many areas that have been cropped, the surface layer is lighter colored. In places mottles are below a depth of 40 inches.

Included with this soil in mapping are small areas of Oakville fine sand, 1 to 6 percent slopes; Morocco fine sand; and Sparta loamy fine sand, 1 to 5 percent slopes. Also included are small areas of Chelsea fine sand, 1 to 6 percent slopes.

This soil is suited to trees or to very limited cropping. Soil blowing and the low available water capacity are severe limitations to most uses. If this soil is used for crops, conservation tillage and other practices that conserve fertility and moisture are needed. Management group IVs-1.

741D—Oakville fine sand, 7 to 18 percent slopes. This is a strongly sloping to moderately steep soil on the sides of ridges that are higher than the surrounding landscape. Most areas are covered with trees.

Included with this soil in mapping are small areas of Oakville fine sand, 1 to 6 percent slopes, and Oakville fine sand, 18 to 40 percent slopes. Also included are small areas of Chelsea fine sand, 1 to 6 percent slopes.

This soil is better suited to trees than to other uses. It is subject to severe soil blowing if the surface is left unprotected by vegetation. Management group VIIs-1.

741F—Oakville fine sand, 18 to 40 percent slopes. This is a steep soil on the sides of prominent ridges that are generally covered with trees. Slopes are north- or east-facing. Included in mapping are small areas of Oakville fine sand, 7 to 18 percent slopes, or Oakville fine sand, 1 to 6 percent slopes.

This soil is best suited to trees because it has steep slopes. Management group VIIs-1.

Onarga Series

The Onarga series consists of nearly level to gently sloping, moderately well drained to well drained soils in higher and better drained positions on the landscape. These soils occur in widely scattered areas throughout the county. They formed in loamy glacial outwash material. The native vegetation was prairie grasses.

In a representative profile the surface layer is very dark gray and very dark grayish brown fine sandy loam about 12 inches thick. The subsoil is dark yellowish brown and dark brown fine sandy loam and sandy clay loam about 17 inches thick. The underlying material is stratified fine sand and loamy fine sand.

Permeability and the available water capacity are moderate. The organic-matter content is moderate.

Onarga soils are used intensively for corn and soybeans. Good management and conservation tillage are needed to conserve moisture and lessen the danger of soil blowing or water erosion.

Representative profile of Onarga fine sandy loam, 2 to 4 percent slopes, 54 feet east and 2,300 feet south of the center of sec. 27, T. 31 N., R. 12 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) fine sandy loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 12 inches; very dark grayish brown (10YR 3/2) fine sandy loam; moderate medium granular structure; friable; neutral; clear smooth boundary.

B1—12 to 15 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) coatings on ped faces; neutral; clear smooth boundary.

B21t—15 to 25 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; dark brown (10YR 3/3) coatings on ped faces; slightly acid; clear smooth boundary.

B22t—25 to 29 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; dark brown (10YR 3/3) coatings on ped faces; slightly acid; gradual wavy boundary.

IIC1—29 to 52 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose; strongly acid; abrupt smooth boundary.

IIC2—52 to 60 inches; dark brown (7.5YR 4/4) loamy fine sand; weak coarse subangular blocky structure; loose; dark brown (7.5YR 4/2) coatings on ped faces; medium acid.

The A horizon ranges from 10 to 16 inches in thickness. It is black and very dark grayish brown fine sandy loam or loam. The B horizon ranges from heavy fine sandy loam or loam to sandy clay loam. The C horizon is dominantly fine sand or loamy fine sand.

In Kankakee County, the Onarga soils have more clay in the B horizon, have less clay in the C horizon, and have a slightly thinner solum than is described as the range of the series. These differences, however, do not affect the use and management of the soils.

Onarga soils are associated with Hoopeston, Ade, and Gilford soils. Onarga soils are better drained and are in higher positions on the landscape than Hoopeston and Gilford soils. They have more clay throughout the profile than Ade soils.

150A—Onarga fine sandy loam, 0 to 2 percent slopes. This is a nearly level soil in areas that are somewhat higher and better drained than the surrounding areas. This soil has a profile similar to the one described as representative of the series, but in most places it has a thicker and darker colored surface layer and has more mottling in the lower part of the subsoil.

Included with this soil in mapping are small areas of Hoopeston fine sandy loam and Ade loamy fine sand, 1 to 5 percent slopes. Also included are small areas where moderately fine textured glacial drift is 4 or 5 feet below the surface.

This soil is suited to all the crops commonly grown in the county. Increasing organic-matter content and controlling soil blowing are the main concerns of management. Conservation tillage is needed to overcome the limitations for crops. Management group IIs-1.

150B—Onarga fine sandy loam, 2 to 4 percent slopes. This soil is on small mounds or short side slopes in areas of flat topography. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Onarga fine sandy loam, 0 to 2 percent slopes, and areas of Ade loamy fine sand, 1 to 5 percent slopes. Also included are areas where the surface layer is thinner or lighter colored than is described as representative of the series and small areas where moderately fine textured glacial drift is 4 or 5 feet below the surface.

This soil is suited to the crops commonly grown in the county. If farmed intensively, it is subject to water erosion or soil blowing. Droughtiness is a problem during mid-summer months. Conservation tillage is needed to conserve moisture and to protect this soil from erosion. Management group IIs-1.

Palms Series

The Palms series consists of very poorly drained, nearly level to depressional organic soils in low-lying areas or depressions. These soils formed in swampy areas in 20 to 51 inches of fibrous plant remains over loamy mineral material. The native vegetation was reeds, sedges, and swamp grasses.

In a representative profile the upper 37 inches of the soil is black and very dark brown muck. The underlying material is gray and pale brown sandy loam.

Permeability is moderately rapid in the upper part and moderate in the underlying material. The available water capacity is high. The organic-matter content is very high.

If adequately drained and fertilized, Palms soils are suited to corn and soybeans. Areas that are too wet to cultivate are in pasture, are left idle, or supply cover for wildlife.

Representative profile of Palms muck, 52 feet west and 1,915 feet north of the southeast corner of sec. 1, T. 31 N., R. 10 E.

Oap—0 to 9 inches; black (N 2/0) broken faced and rubbed sapric material; about 30 percent mineral material; about 10 percent fiber, a trace when rubbed; weak very fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

Oa2—9 to 26 inches; black (N 2/0) broken faced and rubbed sapric material; about 20 percent mineral material; about 15 percent fiber, less than 5 percent when rubbed; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

Oa3—26 to 37 inches; very dark brown (10YR 2/2) broken faced and rubbed sapric material; about 20 percent mineral; about 20 percent fiber, less than 5 percent when rubbed; weak medium and coarse subangular blocky structure; friable; mildly alkaline; abrupt smooth boundary.

IIC—37 to 60 inches; gray (5Y 5/1) and pale brown (10YR 6/3) sandy loam that has limestone rubble in the lower part; single grained; loose; strongly effervescent; moderately alkaline.

The sapric material is 20 to 51 inches thick. The mineral content ranges from 10 to more than 50 percent. Hemic or undecomposed organic layers make up only a small part of the profile. Snail shells are common.

Palms soils are similar to Lena soils but are not so calcareous and have an organic layer that is less than 51 inches thick. Palms soils have a lower concentration of snail shells than Lena soils.

100—Palms muck. This is a nearly level soil in depressions on flat sandy glacial outwash plains. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of recent overwash, small areas where the organic layer is more than 51 inches thick, and small areas where a concentration of marl is 12 to 20 inches below the surface. Calcareous areas are shown on the soil map by conventional symbols.

This soil has limited suitability for crops. It is difficult to drain because outlets are generally inadequate. Management group IIIw-2.

Peotone Series

The Peotone series consists of very poorly drained, nearly level soils in depressions in morainal areas. These soils formed in clayey and silty water-deposited material and the underlying glacial drift. The native vegetation was reeds, sedges, and swamp grasses.

In a representative profile the surface layer is black silty clay loam about 17 inches thick. The subsoil is silty clay loam about 37 inches thick. It is black in the upper part, dark gray in the middle part, and gray in the lower part. The underlying material is gray light silty clay loam. It is mildly alkaline glacial drift.

Permeability is moderately slow, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are cultivated and planted to corn or soybeans. Undrained areas are left idle or are in pasture. Providing adequate drainage is a severe problem because outlets are inadequate in many places and runoff is received from surrounding higher soils.

Representative profile of Peotone silty clay loam, 2,115 feet east and 330 feet north of the southwest corner of sec. 1, T. 32 N., R. 13E.

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

A12—10 to 17 inches; black (10YR 2/1) silty clay loam; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

B21—17 to 26 inches; black (10YR 2/1) heavy silty clay loam; few fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; neutral; clear smooth boundary.

B22g—26 to 34 inches; dark gray (N 4/0) silty clay loam; many medium distinct light olive brown (2.5Y 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; neutral; clear smooth boundary.

B23g—34 to 44 inches; gray (5Y 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; mildly alkaline; gradual wavy boundary.

B3g—44 to 54 inches; gray (5Y 6/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak medium and coarse subangular blocky; firm; mildly alkaline; gradual wavy boundary.

Cg—54 to 60 inches; gray (5Y 6/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; firm; common pebbles; slightly effervescent; moderately alkaline.

The solum ranges from 4 to 5 feet in thickness. The A horizon ranges from 16 to 28 inches in thickness. It is light silty clay loam to light silty clay. The B horizon is black and very dark gray in the upper part, dark gray and gray in the middle part, and gray in the lower part. It is silty clay or silty clay loam in the upper part and silty clay loam in the lower part. The C horizon is silty clay loam.

Peotone soils are associated with Milford, Ashkum, and Sawmill soils. Peotone soils have a thicker A horizon, have a grayer B horizon, and are more poorly drained than Milford and Ashkum soils. They have a thinner A horizon and contain more clay in most of the solum than Sawmill soils.

330—Peotone silty clay loam (0 to 2 percent slopes). This is a nearly level soil in depressions that are subject to standing water or ponding.

Included with this soil in mapping are small areas of Milford, Ashkum, or Sawmill soils. Also included are small marshy or swamp areas that are too wet for cultivation and small areas where the lower part of the subsoil and the underlying material are loam. Marsh or swamp conditions are indicated on the soil map by marsh symbols.

Most areas of these soils are used for cultivated crops. Excess water in spring and early in summer commonly causes crop damage. The use of Peotone silty clay loam depends on adequate drainage. If the drainage system ceases to function, the area can revert to a marshy condition. Providing adequate drainage and maintaining good tilth are necessary for sustained crop production. Management group IIw-2.

Plattville Series

The Plattville series consists of nearly level to gently sloping, moderately well drained to well drained soils in glacial outwash areas. These soils formed in moderately thick deposits of loamy material over slightly weathered limestone bedrock at a depth of 40 to 55 inches. The native vegetation was mainly prairie grasses with some trees in the areas north of the Kankakee River and along Rock Creek.

In a representative profile the surface layer is very dark gray and very dark grayish brown silt loam and loam about 14 inches thick. The subsoil is about 30 inches thick. In the upper 13 inches it is dark yellowish brown loam; in the middle 12 inches it is dark brown sandy clay loam and clay loam; and in the lower 5 inches it is dark yellowish brown clay loam that has many pebbles and broken pieces of limestone. Slightly weathered limestone bedrock is at a depth of 44 inches.

Permeability is moderate above the limestone. The available water capacity is high. The organic-matter content is high. Increasing the organic-matter content and protecting gently sloping areas from erosion are the main concerns of management.

Representative profile of Plattville silt loam, 0 to 2 percent slopes, 1,960 feet north and 1,910 feet west of the southeast corner of sec. 24, T. 31 N., R. 13 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam that has a high sand content; weak very fine and fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—10 to 14 inches; very dark grayish brown (10YR 3/2) loam; weak very fine and fine granular structure; friable; slightly acid; clear smooth boundary.

B1—14 to 19 inches; dark yellowish brown (10YR 4/4) loam; weak very fine subangular blocky structure; friable; continuous very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B21—19 to 27 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; patchy very dark gray (10YR 3/1) coatings on ped faces; medium acid; clear smooth boundary.

B22t—27 to 31 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky structure; firm; medium acid; clear smooth boundary.

B23t—31 to 39 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; patchy dark brown (7.5YR 3/2) coatings on ped faces; common limestone and glacial pebbles; medium acid; abrupt smooth boundary.

B3t—39 to 44 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse subangular blocky structure; firm; continuous dark brown (7.5YR 3/2) coatings on ped faces; many glacial pebbles and yellowish red (5YR 4/8) broken stones; neutral; abrupt smooth boundary.

IIR—44 inches; very pale brown limestone bedrock; fractured in the upper ¼ inch.

The A horizon ranges from 10 to 16 inches in thickness. It is black to very dark grayish brown. The B horizon ranges from 20 to 42 inches in thickness. In most places the upper part of the B horizon is clay loam to loam. In many areas the lower part of the B horizon is mottled. The lower 3 to 6 inches is commonly darker in color and heavier in texture and contains variable amounts of decomposed limestone. The underlying limestone bedrock is slightly weathered and has occasional fracturing.

Plattville soils are on the same landscape as Selma loam, bedrock substratum, and Rockton soils. Plattville soils are better drained than Selma soils. They have a thicker solum over the underlying limestone bedrock than Rockton soils have.

240A—Plattville silt loam, 0 to 2 percent slopes. This is a nearly level soil in irregularly shaped areas. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Rockton loam and small areas where the surface layer and subsoil are coarser textured than is described as representative of the series. Small areas where the surface layer and subsoil are somewhat poorly drained are also included.

This soil is suited to the crops commonly grown in the county. If good management is used, crops can be grown intensively. Management group I-1.

240B—Plattville silt loam, 2 to 4 percent slopes. This is a gently sloping soil that is associated with Plattville silt loam, 0 to 2 percent slopes. It has a profile similar to the one described as representative of the series, but it tends to be slightly eroded and has a thinner surface layer.

Included with this soil in mapping are small areas of Rockton loam, 2 to 4 percent slopes; Plattville silt loam, 0 to 2 percent slopes; and Rockton loam, 0 to 2 percent slopes. Small areas of coarser textured soils are also included.

This soil is suited to the crops commonly grown in the county. Where erosion is a hazard, such erosion-control practices as conservation tillage or contour tillage are needed. Management group IIe-1.

Reddick Series

The Reddick series consists of nearly level, poorly drained soils in all the morainal areas of the county. These soils formed in medium textured glacial outwash material and the underlying glacial till. The native vegetation was prairie grasses adapted to swampy conditions.

In a representative profile the surface layer is black and very dark gray clay loam about 13 inches thick. The subsoil is about 34 inches thick. In the upper 19 inches it is mottled dark gray and gray clay loam, and in the lower 15 inches it is light gray silty clay loam that has yellowish brown mottles. The underlying material is light gray, compact, silty clay loam glacial till that has yellowish brown mottles.

Permeability is moderate in the subsoil and moderately slow to slow in the underlying material. The available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Reddick soils are well suited to these and other commonly grown crops.

Representative profile of Reddick clay loam, 27 feet east and 2,616 feet south of the northwest corner of sec. 34, T. 30 N., R. 9 E.

Ap—0 to 10 inches; black (10YR 2/1) clay loam; moderate very fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

A12—10 to 13 inches; very dark gray (10YR 3/1) clay loam; moderate fine granular structure; friable; mildly alkaline; clear smooth boundary.

B21g—13 to 19 inches; dark gray (10YR 4/1) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate very fine subangular blocky; firm; neutral; clear smooth boundary.

B22g—19 to 25 inches; gray (5Y 5/1) clay loam; many medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark gray (10YR 4/1) coatings on ped faces; mildly alkaline; clear smooth boundary.

B23g—25 to 32 inches; dark gray (10YR 4/1) clay loam; many fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark gray (10YR 4/1) coatings on ped faces; mildly alkaline; abrupt smooth boundary (1 inch horizon of yellowish brown (10YR 5/8) loam at base).

IIB3g—32 to 47 inches; light gray (5Y 6/1 and 7/1) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; firm; gray (5Y 5/1) coatings on vertical ped faces (more pronounced in lower 3 inches); slightly effervescent; moderately alkaline; gradual wavy boundary.

IICg—47 to 60 inches; light gray (5Y 6/1 and 7/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 11 to 18 inches in thickness. It ranges from light loam to clay loam and silty clay loam. The B horizon is dominantly clay loam but sandy clay loam or silty clay loam are within the range. The lower part of the B horizon is commonly stratified and includes some strata of loam or sandy loam. The B3 horizon formed in the underlying glacial till. It is dominantly silty clay loam but is silty clay in places. The C horizon has colors and textures similar to those of the B3 horizon.

Reddick soils are associated with Andres and Symerton soils. Reddick soils are more poorly drained than those soils.

594—Reddick clay loam. This is a nearly level soil on broad ground moraines. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Andres silt loam. Also included are small areas of Ashkum or Milford silty clay loam and areas where the underlying material is loam. Wet areas and calcareous areas are shown on the soil map by conventional symbols.

A seasonal high water table in all areas and the risk of ponding in the lower lying areas can be serious limitations to the use of this soil. Runoff is slow. Tile drains and shallow surface ditches are needed to improve drainage, especially for cultivation early in spring. Management group IIw-1.

Ritchey Series

The Ritchey series consists of gently sloping to moderately steep, shallow, well drained soils along the Kankakee River Valley. These soils formed in thin deposits of loamy glacial outwash material 10 to 20 inches deep over limestone bedrock. The native vegetation was hardwood trees.

In a representative profile the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 10 inches thick. In the upper 7 inches it is dark yellowish brown silty clay loam, and in the lower 3 inches it is brown sandy clay loam. Slightly weathered limestone bedrock is at a depth of 16 inches.

Permeability is moderate above the limestone. The available water capacity is low. The organic-matter content is moderately low.

Ritchey soils in gently sloping to moderately sloping areas are best suited to small grain or meadow crops. The soils in strongly sloping to moderately steep areas are best suited to trees or pasture. The shallow depth to bedrock is a very serious limitation to use.

Representative profile of Ritchey silt loam, 2 to 6 percent slopes, 70 feet north and 1,990 feet west of the southeast corner of sec. 32, T. 32 N., R. 11 E.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam that has a very high sand content; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) silt loam that has a very high sand content; weak medium platy structure parting to moderate medium granular; friable; medium acid; clear smooth boundary.

B21t—6 to 13 inches; dark yellowish brown (10YR 4/4) light silty clay loam that has a high sand content; moderate medium subangular blocky structure; firm; slightly acid; clear smooth boundary.

B22t—13 to 16 inches; brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; mildly alkaline; abrupt smooth boundary.

IIR—16 inches; limestone bedrock; level bedded; slightly weathered.

The A horizon ranges from 4 to 9 inches in thickness. It is silt loam or loam. The light colored A2 horizon is commonly disturbed by plowing. The B horizon ranges from 6 to 14 inches in thickness. In most places it is clay loam or silty clay loam that has a high sand content. The lower part of the B horizon is sandier or cobbly, and only in small areas did it form in residuum weathered from the limestone.

Ritchey soils are on the same landscape as Whalan, Channahon, and Faxon soils. Ritchey soils are more shallow to limestone than Whalan and Faxon soils. They have a thinner A1 horizon than Channahon soils.

311B—Ritchey silt loam, 2 to 6 percent slopes. This is a gently sloping to moderately sloping soil in somewhat elongated areas in the Kankakee River Valley. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Whalan loam, 2 to 4 percent slopes, and Channahon silt loam, 2 to 4 percent slopes. Also included are more nearly level soils and soils that are more shallow to bedrock than is described as representative of the series. Eroded areas and small bedrock escarpments are shown on the soil map by conventional symbols.

This soil is suited to small grain or meadow crops. Areas in trees or pasture should remain in these uses. This soil has very limited potential for use because it is very shallow to bedrock and is subject to erosion. Management group IIIs-3.

311D—Ritchey silt loam, 10 to 15 percent slopes. This is a strongly sloping to moderately steep soil on the short side slopes or breaks of the drainageways along the Kankakee River.

Included with this soil in mapping are small areas of Ritchey silt loam, 2 to 6 percent slopes, and areas where the surface layer is mostly subsoil material. Also included are areas where the limestone bedrock is shallower than typical. Bedrock escarpments that are common along the shore of the river are shown on the soil map by conventional symbols.

This soil is better suited to trees or pasture than to other uses. Erosion is a very serious limitation to any use. Management group VIe-1.

Rockton Series

The Rockton series consists of nearly level to gently sloping, moderately deep, well drained soils along the Kankakee River Valley. These soils formed in moderately deep deposits of loamy glacial outwash material that is 20 to 40 inches deep over limestone bedrock (fig. 6). The native vegetation was prairie grasses.

In a representative profile the surface layer is very dark brown and very dark grayish brown loam about 13 inches thick. The subsoil is clay loam about 17 inches thick. The upper part of the subsoil is dark yellowish brown, and the lower part is light olive brown that has yellowish brown mottles. Slightly weathered limestone bedrock is at a depth of 30 inches.

Permeability is moderate above the limestone. The available water capacity is low to moderate. The organic-matter content is moderate.

Rockton soils have only limited suitability for corn and soybeans because they have a shallow root zone. Controlling erosion and increasing the organic-matter content are the main concerns of management.

Representative profile of Rockton loam, 0 to 2 percent slopes, 2,080 feet north and 85 feet west of the southeast corner of sec. 7, T. 30 N., R. 11 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loam; moderate fine granular structure; friable; mildly alkaline; clear smooth boundary.

A12—9 to 13 inches; very dark grayish brown (10YR

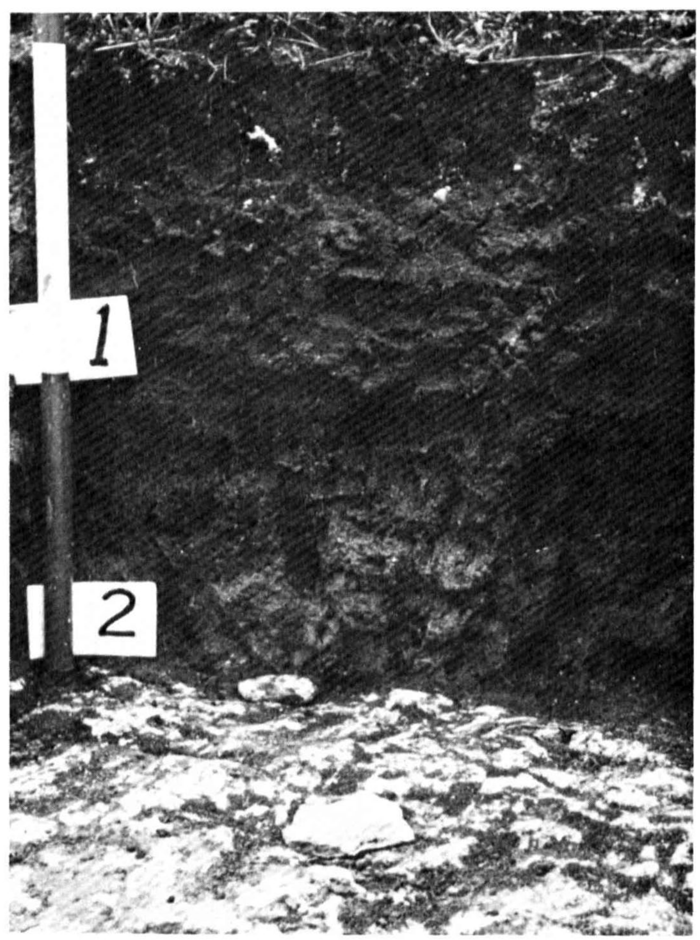

Figure 6.—**A profile of Rockton loam. Limestone bedrock is at a depth of 24 inches.**

3/2) loam; moderate fine and medium granular structure; friable; mildly alkaline; clear smooth boundary.

B21t—13 to 19 inches; dark yellowish brown (10YR 3/4) clay loam; moderate fine subangular blocky structure; friable; continuous very dark brown (10YR 2/2) coatings on ped faces; neutral; clear smooth boundary.

B22t—19 to 25 inches; dark yellowish brown (10YR 4/4) clay loam; common fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; continuous dark grayish brown (10YR 4/2) coatings on ped faces; neutral; clear smooth boundary.

B23t—25 to 30 inches; light olive brown (2.5Y 5/4) clay loam; common medium faint yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; firm; neutral; abrupt smooth boundary (lower 1 or 2 inches is stones and loamy matrix; strongly effervescent; moderately alkaline).

IIR—30 inches; limestone bedrock; level bedded.

The A horizon ranges from 10 to 15 inches in thickness. It is black to very dark grayish brown. The B horizon ranges from 10 to 30 inches in thickness. In most places it is clay loam, but some part of the horizon is commonly loam or sandy loam. The lower part of the B horizon is commonly mottled. A thin contact layer over the bedrock is commonly stony or gravelly and is variable in texture. Only in small areas did the B horizon form in residuum weathered from limestone.

Rockton soils are on the same landscape as Faxon, Plattville, and Whalan soils. Rockton soils are better drained than Faxon soils. They have a thicker A horizon than Whalan soils. Rockton soils have a thinner solum over the underlying limestone bedrock than Plattville soils.

503A—Rockton loam, 0 to 2 percent slopes. This is a nearly level soil in irregularly shaped areas near areas of Faxon clay loam. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Plattville silt loam, 0 to 2 percent sopes, and Channahon silt loam, 0 to 2 percent slopes. Also included are small areas where the surface layer and subsoil are coarser textured than is described as representative of the series. Areas of moderately well drained and somewhat poorly drained soils are also included.

This soil is suited to small grain. Its suitability for corn and soybeans is limited because it has low available water capacity. Management group IIs-3.

503B—Rockton loam, 2 to 4 percent slopes. This is a gently sloping soil near areas of Rockton loam, 0 to 2 percent slopes, and Faxon clay loam. It has a profile similar to the one described as representative of the series, but it has a thinner surface layer and has less mottling in the lower part of the subsoil.

Included with this soil in mapping are small areas where the surface layer is silt loam or sandy loam and areas where the subsoil is coarser textured throughout. Also included are small areas of Rockton loam, 0 to 2 percent slopes, small areas of Plattville or Channahon silt loam, 2 to 4 percent slopes, and areas where the surface layer is thinner than is described as representative of the series.

This soil is suited to small grain. Its suitability for other crops is limited because it has low available water capacity. Water erosion is a severe hazard if tillage is up and down the slope. Management group IIs-3.

Sawmill Series

The Sawmill series consists of poorly drained, nearly level soils on bottom lands. These soils formed in water-laid silty clay loam sediment.

In a representative profile the surface layer is black silty clay loam about 35 inches thick. The subsoil is about 25 inches thick. In the upper 18 inches it is gray silty clay loam, and in the lower 7 inches it is gray clay loam. Yellowish brown mottles are throughout the subsoil.

Permeability is moderate to moderately slow, and the available water capacity is very high. The organic-matter content is high.

Where cultivation is practical, Sawmill soils are well suited to corn and soybeans. Many areas that are frequently flooded and small areas that are dissected by narrow channels are used for bluegrass pasture. Stream overflow and a seasonal high water table are the main concerns of management.

Representative profile of Sawmill silty clay loam, 85 feet west and 2,010 feet south of the northeast corner of sec. 7, T. 32 N., R. 11 E.

A1—0 to 27 inches; black (N 2/0) silty clay loam; moderate fine granular structure; firm; neutral; clear smooth boundary.

A3—27 to 35 inches; black (10YR 2/1) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; mildly alkaline; gradual smooth boundary.

B21g—35 to 44 inches; gray (10YR 5/1) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; mildly alkaline; clear smooth boundary.

B22g—44 to 53 inches; gray (5Y/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; dark gray (2.5Y 4/0) coatings on ped faces; neutral; clear smooth boundary.

B3g—53 to 60 inches; gray (5YR 5/1) clay loam; many medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; dark gray (2.5Y 4/1) coatings on ped faces; neutral.

The A horizon ranges from 24 to 36 inches in thickness. It is light to heavy silty clay loam. The B horizon below a depth of 40 inches ranges from silty clay loam to clay loam and has thin strata of silt and sand.

Sawmill soils formed in material similar to that in which Milford and Peotone soils formed. Sawmill soils have a thicker A horizon and less clay in the B horizon than Milford soils. They have a thicker A horizon than Peotone soils.

107—Sawmill silty clay loam. This is a nearly level soil in small bottom-land areas parallel to stream channels.

Included with this soil in mapping are small areas of silty or loamy overwash and small areas where the surface layer is less than 24 inches thick. Also included are areas where muck is below a depth of 2 feet.

This soil is suited to corn and soybeans and can be intensively cropped if protected from the severe water hazard. Drainage is difficult because of the very severe hazard of flooding. Management group IIw-1.

Selma Series

The Selma series consists of nearly level, poorly drained soils on broad glacial outwash plains, mainly north and east of the Kankakee River. These soils formed in medium textured and moderately coarse textured glacial outwash material. The native vegetation was prairie grasses adapted to swampy conditions.

In a representative profile the surface layer is black and very dark gray heavy loam about 14 inches thick. The subsoil is about 28 inches thick. In the upper 5 inches it is dark grayish brown light clay loam; in the middle 19 inches it is clay loam that has large yellowish brown mottles; and in the lower 4 inches it is gray sandy loam. The underlying material is light gray and light brownish gray sand. It is neutral glacial outwash material.

Permeability is moderate, and the available water capacity is high. The organic-matter content is high.

Most areas of these soils are used intensively for corn and soybeans. Selma soils are well suited to these and other commonly grown crops.

Representative profile of Selma loam, 62 feet west and 2,010 feet south of the northeast corner of sec. 2, T. 31 N., R. 14 E.

Ap—0 to 9 inches; black (10YR 2/1) heavy loam; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 14 inches; very dark gray (10YR 3/1) heavy loam; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

B1—14 to 19 inches; dark grayish brown (2.5Y 4/2) light clay loam; few fine faint yellowish brown (10YR 5/4) mottles; weak fine prismatic structure parting to moderate very fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; neutral; clear smooth boundary.

B21t—19 to 26 inches; gray (5Y 5/1) clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark gray (10YR 4/1) coatings on ped faces; neutral; clear smooth boundary.

B22t—26 to 38 inches; gray (5Y 5/1) clay loam (with 3-inch horizon of silty clay loam); many coarse yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; some very dark gray (10YR 3/1) stains in krotovinas; neutral; clear smooth boundary.

B3—38 to 42 inches; gray (5Y 6/1) sandy loam; weak medium prismatic structure parting to weak medium angular blocky; very friable; very large areas (80 percent) have very dark gray (10YR 3/1) and dark gray (10YR 4/1) stains; neutral; abrupt wavy boundary.

IIC—42 to 60 inches; light gray (5Y 6/1) and light brownish gray (10YR 6/2) sand; single grained; neutral.

The A horizon ranges from 12 to 18 inches in thickness. It ranges from light loam to clay loam. The B2 horizon is dominantly clay loam but includes sandy clay loam and silty clay loam. The B3 horizon is commonly stratified and has variable textures. The underlying material ranges from loam to sand. It is stratified glacial outwash material. Limestone is below the solum at a depth of 40 to 60 inches in places.

Selma soils are associated with Darroch, Jasper, and Gilford soils. Selma soils are more poorly drained than Darroch and Jasper soils. They contain more clay throughout the solum than Gilford soils.

125—Selma loam. This is a nearly level soil on broad glacial outwash plains. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Darroch silt loam and Gilford fine sandy loam. Wet areas, calcareous areas, and gray spots are shown on the soil map by conventional symbols.

If drained, this soil is well suited to most crops commonly grown in the county. A seasonal high water table in all areas and the risk of ponding in the lower lying areas can be serious limitations to use. Runoff is slow. Tile drains and shallow surface ditches are needed to improve drainage, especially for cultivation early in spring. Management group IIw-1.

R125—Selma loam, bedrock substratum. This is a nearly level soil on broad glacial outwash plains. It has a profile similar to the one described as representative of the series, but has limestone bedrock at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of Plattville silt loam, 0 to 2 percent slopes; Rockton loam, 0 to 2 percent slopes; and Faxon clay loam. Wet areas and calcareous areas are shown on the soil map by conventional symbols.

A seasonal high water table in all areas and the risk of ponding in the lower lying areas can be serious limitations in the use of this soil. Runoff is slow. Tile drains and shallow surface ditches are needed to improve drainage, especially for cultivation early in spring. Management group IIw-1.

Sparta Series

The Sparta series consists of nearly level to moderately sloping, excessively drained soils in high-lying areas that vary in size. These soils formed in sandy glacial outwash material. The native vegetation was prairie grasses.

In a representative profile the surface layer is very dark brown loamy fine sand about 17 inches thick. The subsoil is brown and yellowish brown loamy fine sand and fine sand about 19 inches thick. The underlying material is brownish yellow and light yellowish brown fine sand that has strong brown mottles.

Permeability is very rapid, and the available water capacity is low. The organic-matter content is moderately low.

Sparta soils are better suited to small grain and meadow crops than to corn and soybeans. When farmed with surrounding soils, they need special protection from soil blowing.

Representative profile of Sparta loamy fine sand, 1 to 5 percent slopes, 83 feet south and 45 feet east of the northwest corner of sec. 6, T. 30 N., R. 10 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) to black (10YR 2/1) loamy fine sand; weak medium granular structure; very friable; medium acid; abrupt smooth boundary.

A12—7 to 17 inches; very dark brown (10YR 2/2) loamy fine sand; weak medium granular structure; very friable; strongly acid; clear wavy boundary.

B21—17 to 20 inches; brown (10YR 4/3) loamy fine sand; single grained; loose; strongly acid; clear wavy boundary.

B22—20 to 36 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; strongly acid; clear smooth boundary.

C—36 to 62 inches; brownish yellow (10YR 6/6) and light yellowish brown (10YR 6/4) fine sand; many coarse distinct strong brown (7.5YR 5/6) mottles; single grained; loose; strongly acid.

The A horizon ranges from 10 to 18 inches in thickness. It ranges from black to very dark grayish brown loamy fine sand or fine sand. The B horizon is brown to brownish yellow loamy fine sand or fine sand. The C horizon is fine and medium sand that has variable colors. In most places the heavier textured lamellae are below a depth of 5 feet.

Sparta soils are associated with Watseka, Maumee, and Oakville soils. Sparta soils are better drained than Watseka and Maumee soils. They have a thicker and darker colored A horizon than Oakville soils.

88B—Sparta loamy fine sand, 1 to 5 percent slopes. This is a nearly level to moderately sloping soil in areas that are somewhat higher than the surrounding areas.

Included with this soil in mapping are areas where the surface layer is thinner than is described as representative of the series. Also included are small areas of Watseka loamy fine sand and Ade loamy fine sand.

The low available water capacity and natural fertility and the hazard of soil blowing are serious limitations to the use of this soil. If this soil is used for crops, conservation tillage and other good management practices are needed. Management group IVs-1.

Symerton Series

The Symerton series consists of nearly level to gently sloping, moderately well drained and well drained soils in the higher lying areas on ground moraines. These soils formed in medium textured glacial outwash material and the underlying silty clay loam glacial till. The native vegetation was prairie grasses.

In a representative profile the surface layer is black and very dark grayish brown silt loam about 13 inches thick. The subsoil is 31 inches thick. In the upper 13 inches it is dark brown and dark yellowish brown silty clay loam that has a high sand content; in the middle 8 inches it is yellowish brown clay loam that has grayish brown mottles; and in the lower 10 inches it is yellowish brown silty clay loam that has grayish brown mottles. The underlying material is compact brown silty clay loam glacial till.

Permeability is moderate, and the available water capacity is high. The organic-matter content is high.

Symerton soils are well suited to all crops commonly grown in the county. They are used intensively for corn and soybeans. The main concerns of management are maintaining the organic-matter content and protecting sloping areas from erosion.

Representative profile of Symerton silt loam, 2 to 4 percent slopes, 39 feet north and 2,332 feet east of the southwest corner of sec. 8, T. 32 N., R. 11 E.

A1—0 to 9 inches; black (10YR 2/1) silt loam; moderate fine granular structure; friable; neutral; clear smooth boundary.

A3—9 to 13 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; black (10YR 2/1) coatings on ped faces; slightly acid; clear smooth boundary.

B21t—13 to 17 inches; dark brown (10YR 4/3) silty clay loam that has a high sand content; moderate very fine subangular blocky structure; firm; very dark gray (10YR 3/1) discontinuous coatings on ped faces; medium acid; clear smooth boundary.

B22t—17 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam that has a high sand content; weak fine prismatic structure parting to moderate very fine subangular blocky; firm; very dark gray (10YR 3/1) coatings on ped faces; slightly acid; clear smooth boundary.

B23t—26 to 34 inches; yellowish brown (10YR 5/6) clay loam; many coarse distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; neutral; abrupt smooth boundary.

IIB3—34 to 44 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; slightly effervescent; mildly alkaline; gradual wavy boundary.

IIC—44 to 60 inches; brown (10YR 5/3) silty clay loam; many fine faint grayish brown (10YR 5/2) mottles; massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 15 inches in thickness. It is black to very dark grayish brown silt loam and loam. The B horizon is mainly silty clay loam but is clay loam in places. The lower part of the B horizon is commonly stratified with loam or sandy loam. The IIB3 horizon formed in glacial till. It is silty clay loam and has colors similar to the underlying till. The C horizon is silty clay loam that is compact and calcareous.

Symerton soils are associated with Andres and Reddick soils. Symerton soils are better drained than those soils.

294A—Symerton silt loam, 0 to 2 percent slopes. This is a nearly level soil in the somewhat higher lying areas that have good natural drainage. It has a profile similar to the one described as representative of the series but has more mottles in the lower part of the subsoil.

Included with this soil in mapping are small areas of Andres silt loam and Symerton silt loam, 2 to 4 percent slopes. Also included are small areas where the subsoil and underlying material are coarser textured than is described as the range of the series.

This soil is very well suited to crops commonly grown in the county. It can be cropped intensively. Management group I-1.

294B—Symerton silt loam, 2 to 4 percent slopes. This is a gently sloping soil that occupies the higher areas, many of them small, or short side slopes surrounded by more poorly drained and more nearly level soils. It has the profile described as representative of the series.

This soil is well suited to crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. The size and shape of the areas of soil limit the use of some erosion-control practices. Contouring and conservation tillage help to control erosion. Management group IIe-1.

Varna Series

The Varna series consists of nearly level to moderately sloping, moderately well drained and well drained soils on large mounds or side slopes on moraines. These soils formed in silty clay loam glacial till. The native vegetation was prairie grasses.

In a representative profile the surface layer is very dark gray and very dark grayish brown silt loam about 12 inches thick. The subsoil is about 36 inches thick. In the upper 18 inches it is brown, dark yellowish brown, and light olive brown silty clay loam and light silty clay that has yellowish brown mottles, and in the lower 18 inches it is grayish brown and gray silty clay loam. The underlying material is gray, calcareous, silty clay loam glacial till that has yellowish brown mottles.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is high.

Most of the gently sloping Varna soils are suited to cultivated crops, but the severely eroded Varna soil in moderately sloping areas is only suited to limited cropping. Controlling erosion and increasing the organic-matter content are the main concerns of management.

Representative profile of Varna silt loam, 1 to 4 percent slopes, 35 feet north and 770 feet east of the southwest corner of sec. 6, T. 29 N., R. 11 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A3—8 to 12 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

B21t—12 to 18 inches; brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; firm; very dark gray (10YR 3/1) coatings on ped faces; medium acid; clear smooth boundary.

B22t—18 to 24 inches; dark yellowish brown (10YR 4/4) light silty clay; weak fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; very dark grayish brown (10YR 3/2) coatings on ped faces; medium acid; clear smooth boundary.

B23t—24 to 30 inches; light olive brown (2.5Y 5/4) light silty clay; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; firm; discontinuous dark grayish brown (10YR 4/2) coatings on ped faces; neutral; clear smooth boundary.

B31t—30 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak moderate prismatic structure parting to moderate fine and medium subangular blocky; firm; discontinuous dark grayish brown (10YR 4/2) coatings on vertical ped faces; slightly effervescent; moderately alkaline; clear smooth boundary.

B32—42 to 48 inches; gray (5Y 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; patchy dark grayish brown (10YR 4/2) coatings on vertical ped faces; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—48 to 60 inches; gray (5Y 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6 and 5/4) mottles; massive; firm; strongly effervescent; moderately alkaline.

The A horizon ranges from 10 to 15 inches in thickness. It is black to very dark grayish brown silt loam or brown silty clay loam. The upper part of the B horizon is dominantly silty clay loam and silty clay. The lower part of the B horizon and the C horizon are silty clay loam.

Varna soils are associated with Elliott, Ashkum, and Markham soils. Varna soils are better drained than Elliott and Ashkum soils. They have a darker colored and thicker A horizon than Markham soils.

223B—Varna silt loam, 1 to 4 percent slopes. This soil occupies the higher areas or is on short side slopes surrounded by more poorly drained and more nearly level soils. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Elliott silt loam, 0 to 2 percent slopes. Also included are small areas of Symerton silt loam, 2 to 4 percent slopes.

This soil is well suited to the crops commonly grown in the county. Erosion is a hazard if tillage is up and down the slope. The size and shape of the areas of soil limit the use of some erosion-control practices. Contour farming and conservation tillage help to control erosion. Management group IIe-3.

223C3—Varna soils, 4 to 7 percent slopes, severely eroded. This mapping unit is on isolated mounds or on sides of drainageways in moraine areas. It has a surface layer that consists mostly, or entirely of subsoil material and is silty clay loam or silt loam. The organic-matter content is low.

Included with this unit in mapping are small areas where the surface layer contains only small amounts of subsoil material. Also included are small areas where slopes are more than 7 percent.

These soils are suited to only limited row crops. They are better suited to small grain or meadow crops. Erosion has been and will continue to be severe if these soils are farmed without the use of erosion-control practices. Management group IVe-1.

Watseka Series

The Watseka series consists of nearly level, somewhat poorly drained soils in large areas on broad outwash plains. These soils formed in sandy glacial outwash material. The native vegetation was prairie grasses and a mixture of swamp grasses.

In a representative profile the surface layer is black and very dark gray loamy fine sand about 10 inches thick. The subsoil is fine sand about 22 inches thick. In the upper 14 inches it is dark grayish brown, and in the lower 8 inches it is light brownish gray. The underlying material is light gray fine sand.

Permeability is rapid, and the available water capacity is slow. The organic-matter content is moderate.

Watseka soils are farmed intensively, but special management is needed to conserve water and increase fertility for sustained high production. In most areas the water table must be controlled for optimum growth if crops are grown late in summer.

Representative profile of Watseka loamy fine sand, 450 feet south and 55 feet west of the northeast corner of sec. 6, T. 30 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) loamy fine sand; weak medium granular structure; very friable; neutral; abrupt smooth boundary.

A12—8 to 10 inches; very dark gray (10YR 3/1) loamy fine sand; weak medium granular structure; very friable; slightly acid; clear smooth boundary.

B1—10 to 24 inches; dark grayish brown (10YR 4/2) fine sand; common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; loose; discontinuous dark gray (10YR 4/1) coatings on ped faces; slightly acid; gradual irregular boundary.

B2—24 to 32 inches; light brownish gray (10YR 6/2) fine sand; weak coarse subangular blocky structure and single grained; loose; large dark gray (10YR 4/1) and very dark gray (10YR 3/1) stains; medium acid; clear wavy boundary.

C—32 to 60 inches; light gray (10YR 7/2) fine sand; single grained; loose; medium acid.

The A horizon ranges from 10 to 15 inches in thickness. It is black and very dark gray loamy fine sand. The B horizon is mottled dark grayish brown to light brownish gray loamy fine sand or fine sand. The C horizon is gray to light brownish gray fine or medium sand.

Watseka soils are associated with Maumee, Sparta, and Morocco soils. Watseka soils are better drained than Maumee soils and more poorly drained than Sparta soils. They have a thicker and darker colored A horizon than Morocco soils.

49—Watseka loamy fine sand. This is a nearly level soil in areas that are somewhat higher than the surrounding, low-lying Maumee soils. Slope is 0 to 2 percent.

Included with this soil in mapping are small areas of Maumee loamy fine sand and Morocco fine sand. Also included are small areas of Hoopeston fine sandy loam. Some areas of this soil that have concentrations of bog iron are shown on the soil map by conventional symbol.

If special management practices are used, this soil is suited to the crops commonly grown in the county. A seasonal high water table, the low available water capacity and natural fertility, and the hazard of soil blowing are serious limitations to use. Many areas need artificial drainage if they are to be cultivated early in spring. Open surface ditches with water control structures, where needed, help to control the moisture supply to crops. Conservation tillage is needed to reduce soil blowing. Management group IIIw-1.

Whalan Series

The Whalan series consists of nearly level to gently sloping, well drained soils along the Kankakee River Valley. These soils formed in moderately deep deposits of loamy material that is 20 to 40 inches deep over limestone bedrock. The native vegetation was hardwood trees.

In a representative profile the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is 17 inches thick. In the upper 3 inches it is yellowish brown light loam, and in the lower 14 inches it is dark brown heavy loam and clay loam. Slightly weathered limestone bedrock is at a depth of 28 inches.

Permeability is moderate above the limestone. The available water capacity is low to moderate. The organic-matter content is moderately low.

Whalan soils have only limited suitability for corn or soybeans because they have a moderate root zone. If these soils are cultivated, controlling erosion and increasing the organic-matter content are the main concerns of management.

Representative profile of Whalan loam, 2 to 4 percent slopes, 1,325 feet east and 950 feet north of the center of sec. 9, T. 31 N., R. 11 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) loam; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A2—5 to 11 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak platy structure; friable; very dark grayish brown (10YR 3/2) stains; strongly acid; clear smooth boundary.

B1—11 to 14 inches; yellowish brown (10YR 5/4) light loam; moderate very fine subangular blocky structure; friable; dark grayish brown (10YR 4/2) stains; medium acid; clear smooth boundary.

B21t—14 to 21 inches; dark yellowish brown (10YR 4/4) heavy loam; moderate fine subangular blocky structure; firm; dark grayish brown (10YR 4/2) clay films on vertical ped faces; slightly acid; clear smooth boundary.

B22t—21 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm dark grayish brown (10YR 4/2) clay films on ped faces; slightly acid; clear smooth boundary.

IIR—28 inches; light gray (10YR 7/2) limestone bedrock.

The A horizon ranges from 6 to 13 inches in thickness. It is very dark grayish brown to grayish brown sandy loam to silt loam. In areas that have been disturbed by plowing, the A2 horizon is commonly lacking. The B horizon ranges from 10 to 30 inches in thickness. In most places it is clay loam, but parts of the horizon are commonly loam or sandy loam. The lower part of the B horizon is commonly mottled. A thin contact layer over the bedrock is commonly stony or gravelly and is variable in texture. Only in small areas did the B horizon form in residuum weathered from limestone. The underlying limestone bedrock is slightly weathered.

Whalan soils are on the same landscape as Ritchey, Rockton, and Faxon soils. Whalan soils are better drained and lighter colored than Faxon soils. They lack the thick A horizon of Rockton soils. They are deeper to bedrock than Ritchey soils.

509A—Whalan loam, 0 to 2 percent slopes. This is a nearly level soil in irregularly shaped areas associated with Ritchey silt loam, 2 to 6 percent slopes, and Whalan loam, 2 to 4 percent slopes. It has a profile similar to the one described as representative of the series, but it averages more than 30 inches deep to bedrock and has more mottling in the lower part of the subsoil.

Included with this soil in mapping are small areas of Rockton loam, 0 to 2 percent slopes and 2 to 4 percent slopes, and Ritchey silt loam, 2 to 6 percent slopes. Small areas of somewhat poorly drained soils and soils that have a higher sand content are also included.

This soil is suited to small grain. Its suitability for corn and soybeans is limited because it has low available water capacity. Areas in woodland or pasture should remain in these uses. Management group IIs-3.

509B—Whalan loam, 2 to 4 percent slopes. This is a gently sloping soil near Whalan loam, 0 to 2 percent slopes, and Ritchey silt loam, 2 to 6 percent slopes. It has the profile described as representative of the series.

Included with this soil in mapping are small areas where the surface layer is silt loam or sandy loam. Also included are small areas of Whalan loam, 0 to 2 percent slopes, and small areas of Ritchey silt loam, 2 to 6 percent slopes. Small areas of eroded soils are also included.

This soil is suited to small grain. Its suitability for other crops is limited because it has low available water capacity and is subject to severe erosion if tilled up and down the slope. Areas in woodland or pasture should remain in these uses. Management group IIe-1.

Use and Management of the Soils

The soil survey is a detailed analysis and evaluation of the most basic resource of the survey area—the soil. It may be used to fit the use of the land, including urbanization, to the limitations and potentials of the natural resources and the environment and to help avoid soil-related failures in uses of the land.

During a soil survey soil scientists, conservationists, engineers, and others keep extensive notes, not only about the nature of the soils but also about unique aspects of behavior of these soils in the field and at construction sites. These notes include observations of erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic systems, and other factors relating the kinds of soil and their productivity, potentials, and limitations under various uses and management. In this way field experience incorporated with measured data on soil properties and performance is used as a basis for predicting soil behavior.

Information in this section will be useful in applying basic facts about the soils to plans and decisions for use and management of soils for crops and pasture, woodland, and many nonfarm uses, including building sites, highways and other transportation systems, sanitary facilities, parks and other recreational developments, and wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and it is possible to avoid the costly failures that occur when homes and other structures are built on soils that have unfavorable properties. A site can be selected where the soil properties are favorable, or practices can be planned that will overcome the soil limitations.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area, or other broad planning area, and on the environment. Both of these factors are closely related to the nature of the soil. Plans can be made to maintain or create a land use pattern in harmony with the natural soil.

Contractors can find information useful in locating sources of sand and gravel, road fill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, trees and shrubs, and most other uses of land are influenced by the nature of the soil.

Crops and Pasture

About 71 percent of Kankakee County is cultivated. Corn and soybeans are the principal crops. Wheat, oats, grass-legume hay, truck crops, gladioli, sodgrass, and nursery crops are also important.

The main concerns in managing cultivated soils in the county are controlling soil blowing and erosion, overcoming wetness, and protecting the soils from ponding or flooding. Conserving moisture and maintaining tilth and fertility are other management concerns that are important in sustaining high production.

Measures that help to control soil blowing and erosion include contour farming; conservation tillage; and use of cover crops, windbreaks, grassed waterways, and, where practical, terraces. Generally a combination of several measures is most satisfactory.

Measures that help to overcome wetness include the use of tile drains, shallow surface ditches, surface inlets to tile drains, drainage ditches, and diversions. Using levees or, where practical, decreasing runoff from the watershed helps to control flooding.

Conserving moisture generally means reducing evaporation, limiting runoff, increasing infiltration, controlling the water table, and controlling weeds. Practices that help to conserve moisture include conservation tillage, use of crop residue, contour farming, and use of buffer strips and field windbreaks.

Among the measures that help to maintain tilth and fertility are the application of chemical fertilizer, green manure, and barnyard manure and the inclusion in the cropping system of cover crops, grasses, and legumes. Crops respond well to fertilizers on all soils used as cropland. Applications of lime are needed periodically on many soils, but Fieldon and Lena soils are moderately alkaline or calcareous and do not need these applications. Controlling soil blowing and erosion also helps to conserve fertility and maintain tilth.

Uses of the soils and general methods of management are discussed in the sections that follow.

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 recreation, forest trees, or engineering.

In the capability system, the soils are grouped at three levels: the capability class, the subclass, and the unit.

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, woodland, or wildlife habitat. (No class V soils are in the county.)

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply or to esthetic purposes. (No class VIII soils are in the 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. (No *c* subclasses are in Kankakee 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, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are discussed as management groups in this survey. 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 have similar 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, IIw-1 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 paragraph; and the Arabic numeral specifically identifies the management group within each subclass.

In the following pages the management groups in Kankakee County are described, and suggestions for use and management for all the soils of each group are given. Soils used for cultivated crops generally need lime and fertilizers. The amounts to apply on a given soil should be determined by soil tests. To find the names of all the soils in any given management group, refer to the "Guide to Mapping Units" at the back of this survey.

MANAGEMENT GROUP I-1

This group consists of deep, nearly level, somewhat poorly drained to well drained soils that formed in loamy glacial outwash deposits. The surface layer is silt loam or loam. The subsoil is silty clay loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is high. The organic-matter content is moderate to high.

These soils have no major limitation to use, but fertility and tilth need to be maintained. Tile drains are needed in some areas to remove excess water before tilling in spring.

The soils in this group are well suited to corn, soybeans, and the other commonly grown crops. They are seldom used for pasture or woodland. Row crops can be grown intensively.

MANAGEMENT GROUP IIe-1

This group consists of deep and moderately deep, gently sloping, moderately well drained and well drained soils that formed in glacial outwash material. The surface layer is silt loam or loam. The subsoil is silty clay loam, loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is low to high. The organic-matter content is moderately low to high.

Controlling erosion is the main concern of management. Erosion and runoff can be easily controlled by conservation practices including conservation tillage. Returning all crop residues to the soil also helps to maintain the organic-matter content and provide good tilth. If such conservation practices as terracing and contouring are used, more row crops can be grown in the rotation. Grassed waterways remove excess water safely (fig. 7) in places where runoff concentrates.

These soils are mainly used for corn and soybeans. They are suited to these and to the other commonly grown crops. In areas used for pasture, adapted varieties of legumes and grasses should be favored when pastures are reseeded.

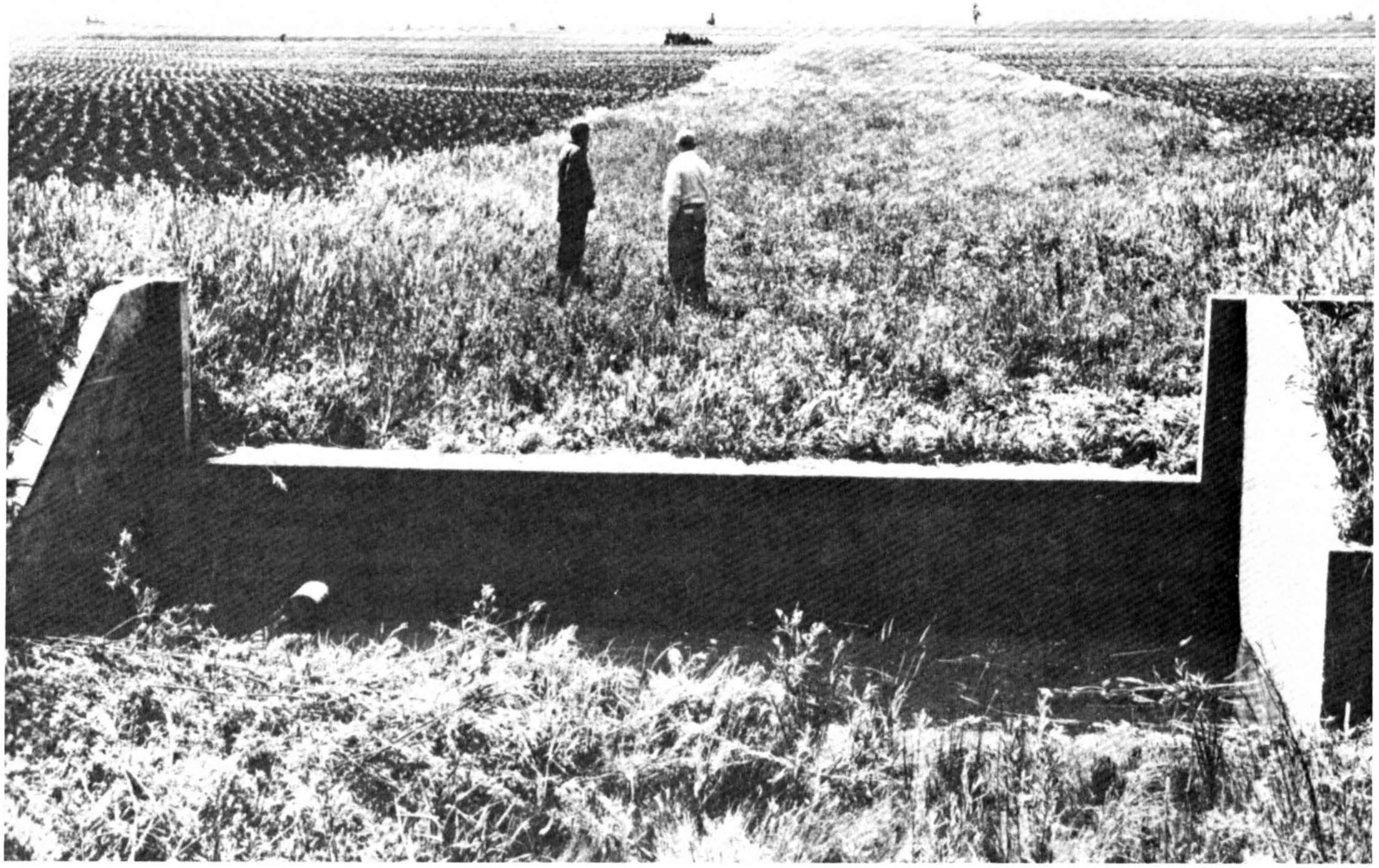

Figure 7.—A newly established grassed waterway and grade control structure in an area of Symerton silt loam, 2 to 4 percent slopes.

MANAGEMENT GROUP IIe-2

This group consists of deep, gently sloping, somewhat poorly drained soils that formed in glacial till on uplands. The surface layer is silt loam. The subsoil is silty clay or heavy silty clay loam.

Permeability is moderately slow and slow, and the available water capacity is moderate. The organic-matter content is high and moderate.

The main concerns of management are controlling erosion and maintaining good tilth and organic-matter content. Where mechanical erosion control practices are not practical, a conservation cropping system and conservation tillage are needed. Returning all crop residues to the soil helps to maintain the organic-matter content and provide good tilth. Grassed waterways help to remove excess water and retard erosion.

These soils are well suited to corn, soybeans, and the other commonly grown crops. If well managed, they can be used intensively for cultivated crops.

MANAGEMENT GROUP IIe-3

This group consists of deep, gently sloping, moderately well drained and well drained soils that formed in glacial till on uplands. The surface layer is silt loam. The subsoil is heavy silty clay loam or silty clay.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content of the surface layer is moderate to high.

The main concern of management is controlling erosion. Maintaining good tilth and increasing the organic-matter content are also important. Where contour farming is not practical, a cropping system that provides maximum soil protection and conservation tillage are needed. All crop residues should be returned to the soil. Grassed waterways help to remove excess water and retard erosion.

These soils are well suited to corn, soybeans, and the other commonly grown crops. If well managed, they can be used intensively for cultivated crops.

MANAGEMENT GROUP IIw-1

This group consists of nearly level, poorly drained soils that formed in glacial outwash and alluvial sediment. The surface layer is loam, clay loam, and silty clay loam. The subsoil is clay loam, silt loam, and silty clay loam.

Permeability is moderate, and the available water capacity is high or very high. The organic-matter content is high. These soils have a high water table, and most are subject to occasional flooding from stream overflow. Runoff is slow.

Wetness is the main limitation to the use of these soils. Providing adequate drainage and protection from flooding are the main concerns of management. Tile drains, surface drains, and dikes can be used individually or in combination to provide adequate drainage.

If these soils are protected from flooding and adequately drained, they are well suited to row crops and small grains. Hay and pasture crops are better adapted than other crops if flooding and wetness are controlled.

MANAGEMENT GROUP IIw-2

This group consists of deep, poorly drained and very poorly drained, nearly level soils that formed in glacial lake-laid sediment and glacial till. The surface layer is silty clay loam. The subsoil is silty clay loam and silty clay.

Permeability is moderately slow, and the available water capacity is moderate to high. The organic-matter content is high.

Providing adequate drainage is the main concern of management. Tile drainage is effective where adequate outlets are available. Tile lines should be spaced closely because these soils have moderately slow permeability. Open ditches are used to provide outlets for the tile lines.

Good management practices and conservation tillage are needed to maintain tilth and organic-matter content. All crop residues should be returned to the soil. These soils are difficult to work if plowed when wet. Very large acreages are plowed in fall and left bare during winter. This is done to balance the workload and allow freezing and thawing to break up large clods and reduce the effects of compaction.

The soils in this group are well suited to corn, soybeans, and the other commonly grown crops. They are seldom used for pasture or woodland. Row crops can be grown intensively.

MANAGEMENT GROUP IIw-3

This group consists of deep, nearly level, somewhat poorly drained soils that formed in glacial outwash, till, and lake-laid sediment. The surface layer is silt loam or loam. The subsoil is silty clay loam, loam, clay loam, or silty clay.

Permeibility is moderately slow, and the available water capacity is moderate to high. The organic-matter content is high.

Providing drainage and maintaining good tilth and organic-matter content are the main concerns of management. Artificial drainage is needed in many areas. Tile drains with adequate outlets are most effective. A cropping system is needed that includes conservation tillage and provides enough crop residue to provide good tilth and maintain organic-matter content.

These soils are well suited to corn, soybeans, and the other commonly grown crops. If well managed, they can be farmed intensively.

MANAGEMENT GROUP IIw-4

This group consists of deep, nearly level, poorly drained and somewhat poorly drained soils that formed in glacial lake-laid sediment and glacial till. The surface layer is silty clay or silt loam. The subsoil is silty clay and silty clay loam. Permeability is slow, and the available water capacity is moderate.

Providing adequate drainage and maintaining good tilth are the main concerns of management. Tile drainage alone is not effective because these soils have slow permeability. Tile drains are most effective when used with surface inlets where water tends to pond. In most areas a combination of shallow surface drains and random tile lines is most effective. Open ditches are used to collect water from the surface drains and tile lines.

Good management practices and conservation tillage are needed to maintain tilth and organic-matter content. All crop residues should be returned to the soil. These soils are very difficult to work if plowed when wet. Very large acreages are plowed in fall and left bare during winter. This is done to balance the workload and allow freezing and thawing to break up large clods and reduce the effects of compaction.

The soils in the group are suited to corn, soybeans, and other commonly grown crops. They are seldom used for pasture or woodland. Row crops can be grown intensively.

MANAGEMENT GROUP IIs-1

This group consists of deep, nearly level to gently sloping, well drained and moderately well drained soils that formed in glacial outwash material. The surface layer is fine sandy loam. The subsoil is fine sandy loam, sandy clay loam, or loamy fine sand.

Permeability is moderate and moderately rapid, and the available water capacity is moderate. The organic-matter content is moderate to moderately low.

A cropping system that includes small grains and meadow is needed. Careful management of crop residues helps to increase the organic-matter content and conserve moisture. Frequent moderate applications of fertilizer are more effective than occasional large applications. Reducing field widths helps to control soil blowing.

The soils in this group are well suited to small grains. They are less suited to other crops because they have only moderate available water capacity and are subject to soil blowing. These soils are mainly used for corn and soybeans, but some areas are used for other commonly grown crops, pasture, and trees. In areas used for pasture, adapted varieties of legumes and grasses should be favored when pastures are reseeded.

MANAGEMENT GROUP IIs-2

This group consists of deep, nearly level, somewhat poorly drained soils that formed in loamy glacial outwash material. The surface layer is fine sandy loam to silt loam. The subsoil is fine sandy loam to silty clay loam. Most of these soils are underlain by stratified loam and sand. Some are underlain by cobbly fine sandy loam.

Permeability is moderately rapid and moderate, and the available water capacity is moderate. The organic-matter content is moderate to moderately low.

Providing adequate drainage and protection from soil blowing and increasing the organic-matter content are the main concerns of management. Some additional artificial drainage is needed in many areas. Shallow surface drains used with random tile lines are most effective. Frequent moderate applications of fertilizer are more effective than occasional large applications. A cropping system is needed that includes conservation tillage and returns all crop residue to the soil.

These soils have a limited suitability for corn and soybeans because they have limited available water capacity. If good management is used, however, they can be farmed intensively.

MANAGEMENT GROUP IIs-3

This group consists of moderately deep, well drained, nearly level soils that formed in loamy outwash material. The surface layer is loam. The subsoil is clay loam or loam. These soils are underlain by limestone bedrock at a depth of 20 to 40 inches.

Permeability is moderate above the bedrock. The available water capacity is low to moderate. The organic-matter content is moderate to moderately low.

Increasing the available water capacity and maintaining soil tilth by the return of crop residues are the main concerns of management. Conservation tillage and crop rotations that have a minimum amount of row crops are needed.

These soils are not well suited to corn and soybeans. If good management is used, however, they can be farmed intensively using rotations of small grain, meadow crops, and row crops.

MANAGEMENT GROUP IIIe-1

This group consists of deep, gently sloping to moderately sloping, somewhat poorly drained to well drained soils that formed in silty clay and silty clay loam glacial till and drift. The surface layer is silt loam. The subsoil is silty clay or silty clay loam. The underlying material is clayey glacial drift or till.

Permeability is moderately slow and slow, and the available water capacity is moderate. The organic-matter content is moderate.

Controlling erosion is the main concern of management. Other concerns are maintaining tilth and organic-matter content and cultivating the soils in some wet areas in spring. Such conservation practices as terracing and contouring are used to control erosion where the topography is favorable. Because areas of Frankfort soils are small, erosion is better controlled by using a cropping system that includes small grain and meadow crops. All crop residues should be returned to the soil to maintain the organic-matter content and provide good tilth. Grassed waterways remove excess water safely.

If continually used for cultivated crops, these soils need intensive conservation practices. If the soils are used for pasture, adapted varieties of legumes and grasses should be favored when pastures are reseeded. Existing stands of timber should not be cleared.

MANAGEMENT GROUP IIIw-1

This group consists of deep, somewhat poorly drained to very poorly drained, nearly level soils that formed in loamy and sandy glacial outwash material. Permeability is moderately rapid to very rapid, and the available water capacity is low. These soils have a high water table.

Controlling the high water table and providing adequate drainage are the main concerns of management. If farmed intensively, these soils require dug ditches that have water table control structures. (fig. 8).

These soils have limited suitability for row crops because they have low to moderate available water capacity. They are better suited to small grain, hay, and pasture. A few undrained areas are marshy and are best used as wetland wildlife habitat.

MANAGEMENT GROUP IIIw-2

This group consists of deep, nearly level and depressional, very poorly drained organic soils that formed in decayed residue from aquatic plants. These soils commonly receive runoff from surrounding areas and are subject to ponding.

Permeability is rapid to moderately rapid, and the available water capacity is high to very high. Natural fertility is somewhat low. Some soils are calcareous throughout the profile.

Providing adequate drainage is the main concern of management. Other concerns are providing adequate

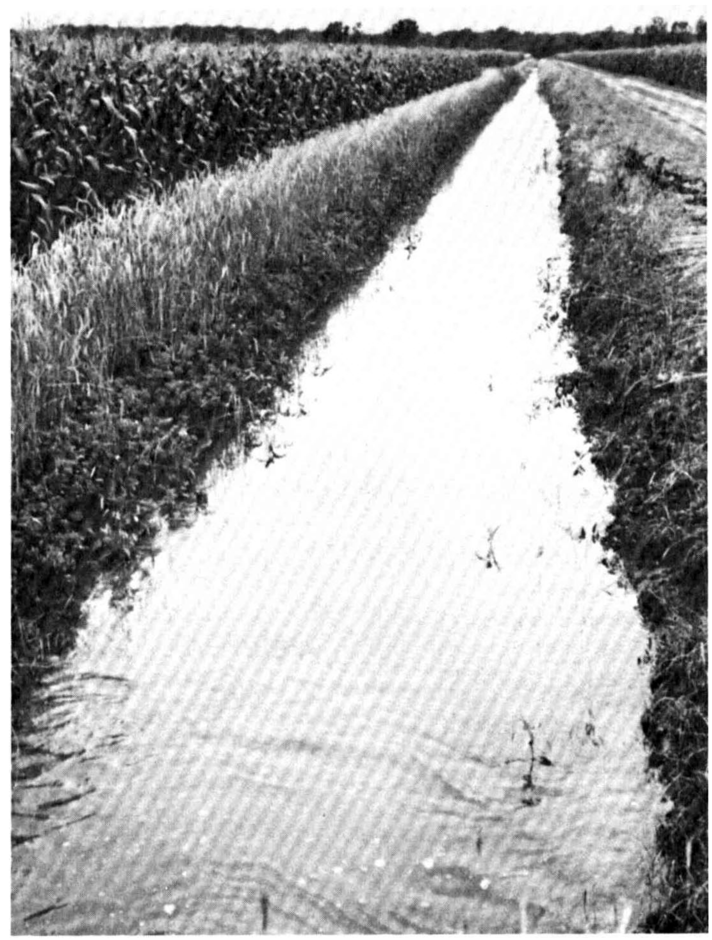

Figure 8.—**In this area of Maumee loamy fine sand, open ditches help control the amount of water supplied to crops.**

fertilization and controlling the ground water level during the growing season.

If drained, these soils are well suited to corn and soybeans. They are seldom used for small grain and meadow crops. Some areas that are too wet for row crops are used for pasture or are left idle and provide an excellent habitat for wildlife.

MANAGEMENT GROUP IIIw-3

This group consists of nearly level, poorly drained soils that formed in loamy glacial outwash material. The surface layer and subsoil are loam or clay loam.

Permeability is moderate, and the available water capacity is moderate to high. The organic-matter content is high.

Providing adequate drainage is the main concern of management. Artificial drainage is needed in many areas. Shallow surface drains used with random tile lines are most effective. A cropping system that includes conservation tillage and returns all crop residues to the soil is important in maintaining good tilth.

These soils are well suited to corn and soybeans. If well managed, they can be farmed intensively.

MANAGEMENT GROUP IIIs-1

This group consists of deep, moderately well drained to somewhat excessively drained, gently sloping to moderately sloping soils that formed in sandy and loamy glacial outwash material. The surface layer is loamy fine sand or fine sandy loam. The subsoil is fine sandy loam, loamy fine sand, and fine sand.

Permeability is moderately rapid to rapid, and the available water capacity is low to moderate. The organic-matter content is moderately low.

Controlling soil blowing and water erosion are the main concerns of management. Overcoming droughtiness and low fertility are also concerns. Frequent moderate applications of fertilizer are more effective than occasional large applications.

The soils in this group are well suited to small grain and limited row crops. These soils have limited suitability for corn and soybeans because they have low to moderate available water capacity. If row crops are grown, conservation tillage and buffer strips are needed to control soil blowing. Crop residues should be left on the surface. Existing stands of trees should not be cleared.

MANAGEMENT GROUP IIIs-3

This group consists of shallow, well drained, nearly level to gently sloping soils that formed in thin loamy sediment over limestone bedrock. The surface layer is silt loam. The subsoil is silty clay loam. These soils are underlain by limestone bedrock at a depth of 10 to 20 inches.

Permeability is moderate above the bedrock. The available water capacity is low. The organic-matter content is moderate to moderately low.

The hazard of erosion on the sloping soils and the low available water capacity of all the soils are the main concerns of management. In cultivated areas conservation tillage and a crop rotation that uses mainly small grain and meadow crops are needed.

These soils are better suited to small grain, pasture, and meadow crops than to other uses. If the soils are used for pasture, adapted varieties of legumes and grasses should be favored when pastures are reseeded. Existing stands of trees should not be cleared.

MANAGEMENT GROUP IVe-1

This group consists of moderately well drained, moderately sloping, severely eroded soils that formed in silty clay loam glacial till. The surface layer consists mainly of material from the upper part of the subsoil and is silty clay loam. The subsoil is silty clay to silty clay loam. The underlying material is calcareous silty clay loam glacial till.

Permeability is moderately slow, and the available water capacity is moderate. The organic-matter content is low.

Controlling erosion, improving soil tilth, and increasing organic-matter content are the main concerns of management. Such conservation practices as terracing and contouring, conservation tillage, and grassed waterways should be used in combination if cultivated crops are grown. A cropping system that consists of small grain and meadow crops is less susceptible to erosion and requires less intensive conservation practices and measures.

These soils have a limited suitability for row crops. They are well suited to meadow crops, pasture, or trees.

MANAGEMENT GROUP IVs-1

This group consists of nearly level to moderately sloping, excessively drained and somewhat poorly drained soils that formed in sandy outwash material. The surface layer is fine sand or loamy fine sand. The subsoil is fine sand.

Permeability is rapid to very rapid, and the available water capacity is low. The organic-matter content is moderately low to low.

Controlling soil blowing, increasing organic-matter content, and providing a balanced fertilization program are the main concerns of management if these soils are cropped. Conservation tillage practices are needed that leave the surface protected by crop residue during the whole year. A cropping system that uses small grain and meadow crops is suited in cultivated areas. If these soils are used for pasture or hayland, adapted varieties of legumes and grasses should be favored. Existing stands of trees should not be cleared, and many areas of these soils can be planted to pine to control soil blowing.

MANAGEMENT GROUP VIe-1

This group consists of deep, moderately steep and steep, well drained soils that formed in silty clay loam glacial till and shallow, strongly sloping to steep, well drained soils that formed in thin loamy outwash over limestone bedrock.

Permeability is moderate and moderately slow, and the available water capacity is low to moderate. The organic-matter content is moderately low to moderate. Runoff is rapid.

Controlling erosion is the main concern of management. Droughtiness is a concern on the shallow Ritchey soils. Reestablishing permanent vegetation in areas that were once cropped is difficult because of the hazard of erosion, rapid runoff, and steep slopes. Established hay and pasture crops need to be maintained by good management. Woodland areas need to be protected from fire and grazing. These soils are better suited to pasture, hay, and trees than to other uses.

MANAGEMENT GROUP VIIs-1

This group consists of deep, sloping to very steep, well drained to excessively drained soils that formed in loamy and sandy glacial outwash material. The surface layer is fine sandy loam and fine sand. The subsoil is fine sandy loam to fine sand.

Permeability is moderately rapid to very rapid, and the available water capacity is moderate to low. The organic-matter content is low to moderately low.

These soils are not suited to cultivated crops because they have steep slopes and are droughty. They are better suited to pasture, hay, and woodland. Good pasture management is essential to maintain grass stands and insure maximum returns. Woodland areas should be maintained and protected from fire and grazing. Evergreen trees are adapted to planting in most areas.

MANAGEMENT GROUP VIIw-1

The very poorly drained Gilford fine sandy loam, wet, is the only soil in this group. It is subject to frequent flooding and ponding and can be used only for pasture, woodland, and wetland wildlife habitat. At present it is impractical to protect most of these areas from flooding or ponding. The present uses should be improved upon when and where possible.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 4. In any given year, yields may be higher or lower than those indicated in table 4 because of seasonal variations in rainfall and other climatic factors. Absence of a yield estimate indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The latest soil and crop management practices used by many farmers in the county are assumed in predicting the yields. Hay and pasture yields are predicted for varieties of grasses and legumes suited to the soil. A few farmers may be using more advanced practices and obtaining average yields higher than those shown in table 4.

The management needed to achieve the indicated yields of the various crops depends upon the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yield-

TABLE 4.—*Yields per acre of crops and pasture*

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited. Only arable soils are listed]

Soil name and map symbol	Corn	Soybeans	Wheat, winter	Oats	Grass-legume hay	Bromegrass-alfalfa
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM*[1]
Watseka: 49	80	28	37	56	3.4	6.0
Milford: 69	115	40	48	70	4.8	7.3
Sparta: 88B	45			35	2.5	3.0
Maumee: 89	110	38			3.6	
Ade: 98B	75	26			2.5	3.0
Palms: 100	105	42				
Sawmill: 107	125	41		67	4.9	
Selma:						
125	118	40	46	69	4.5	
R125	110	40	45	65	4.4	
Alvin:						
131B	80	27	38	57	3.5	5.7
131C2	75	24	35	53	3.2	5.3
131F					2.5	4.2
Elliott:						
146A	110	38	47	72	4.6	7.2
146B	105	34	43	68	4.4	7.0
Onarga:						
150A	94	34	42	61	3.8	6.0
150B	91	30	38	56	3.8	6.0
Hoopeston: 172	91	30		64	3.7	6.5
Beardstown: 188	101	34	45	60	4.1	6.5
Martinton: 189	117	41	50	76	4.8	7.5
Morley:						
194B	90	33	45	60	3.6	6.2
194C	82	28	39	54	3.4	5.9
194E2					2.5	4.1
194C3	68		28	44	2.6	4.3
Gilford: 201	120	42	54		4.0	
Lena: 210	109	37				
Varna:						
223B	101	37	46	66	4.3	6.8
223C3	80	22	29	45	3.4	5.5
Ashkum: 232	115	40	48	70	4.8	
Bryce: 235	104	39	42	64	4.0	6.5
Plattville:						
240A	102	38	46	68	4.2	7.0
240B	99	36	42	66	4.1	6.8
Andres: 293	126	45	55	80	5.0	8.0
Symerton:						
294A	122	43	54	79	5.0	8.0
294B	118	40	51	75	4.9	8.0
Mokena: 295	110	37		70	4.3	7.0

TABLE 4.—*Yields per acre of crops and pasture*—Continued

Soil name and map symbol	Corn	Soy-beans	Wheat, winter	Oats	Grass-legume hay	Brome-grass-alfalfa
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM*[1]
Beecher:						
298A	101	35	44	65	4.1	6.6
298B	96	32	40	60	4.0	6.5
Ritchey:						
311B	55	23	32	45	2.6	4.1
311D					2.1	3.5
Channahon:						
315A	65	26	35	50	2.9	5.0
315B	61	23	31	45	2.8	4.8
Frankfort:						
320A	86	32	42	57	3.6	5.8
320B	82	28	37	53	3.4	5.5
Peotone: 330	113	43	47	70	4.5	7.0
Fieldon: 380	70	25		65	3.5	5.0
Jasper:						
440A	130	46	52	80	4.3	7.7
440B	125	44	50	77	4.1	7.7
Bonfield: 493	102	37	45	65	4.1	7.1
Kankakee:						
494A	106	40	50	70	4.5	7.2
494B	94	35	44	63	4.2	6.8
Morocco: 501	80	28			2.6	
Rockton:						
503A	95	28		70	4.0	5.6
503B	90	26		65	4.0	5.6
Whalan:						
509A	85	25		65	3.8	5.0
509B	80	24		60	3.8	5.0
Faxon: 516	85	30		65	3.0	4.5
Markham:						
531B	93	35	43	63	4.1	6.6
531C2	88	31	39	57	3.7	6.0
531C3	71	19	24	40	3.2	5.2
Reddick: 594	110	38	48	70	4.5	6.8
Darroch: 740	120	42	52	75	4.3	7.5
Oakville:						
741B	50		24	48	2.0	3.0
741D				35	1.8	2.8
741F					1.5	2.5
Comfrey: 776	85	34		75	3.5	5.7
Chelsea: 779B	57	21		42	2.0	3.0

[1] Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

ing crop varieties; appropriate tillage practices, including timely tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

Crops other than those shown in table 4 are grown in the survey area, but because their acreage is small, predicted yields for these crops are not included. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the productivity and management concerns of the soils for these crops.

Woodland

When the first settlers arrived in Kankakee County, about 15 percent of the area, or 65,000 acres, was forested in excellent stands of oak, hickory, maple, and other hardwood trees. However, following many years of timber clearing, grazing, and burning, only about 17,819 acres of woodland now remain, most of it in understocked stands of poor-quality trees. Since 1967, the demand for wooded homesites, sand mining, and increased cropland has further reduced the acreage.

A large part of the woodland is on Oakville and Chelsea soils, which are unfavorable for cropland, on steep Morley and Alvin soils, and on the frequently flooded areas along the Kankakee River east of Momence (fig. 9).

Many areas of severely eroded, low-producing, sandy soils, areas of soils that are shallow to bedrock, and strip mined areas should be reforested. Well managed woodland not only produces wood products, but helps to control erosion, protect watersheds, and provide wildlife habitat. It also offers many recreational, educational, and esthetic opportunities.

The soils of Kankakee County have been placed into seven tree planting groups. In table 5 each group is briefly described, and the mapping units in each group are listed. The trees best suited for forest, windbreaks, and decoration are shown. The tree planting group classification of each mapping unit is given in the "Guide to Mapping Units" at the back of this publication.

Cut and fill land, quarries, made land, and strip mines were not placed in tree planting groups.

Wildlife

Wildlife in Kankakee County is classified in three major groups: openland, woodland, and wetland. Soils in the county have potential for habitat development for all three kinds of wildlife.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the development of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, inadequate, or inaccessible, wildlife will either be scarce or will not inhabit the area.

If the soils have the potential, wildlife habitat can

TABLE 5.—*Tree planting guide*

Tree planting group and map symbols	Forest trees	Ornamentals	Windbreak trees
Group 1: Well drained and moderately well drained soils that have moderate to very rapid permeability. 131B, 131C2, 131F, 150A, 150B, 240A, 240B, 294A, 294B, 440A, 440B, 494A, and 494B.	In sheltered coves and on north- and east-facing slopes: White oak, red oak (northern), eastern white pine, red pine, and black walnut. On exposed ridges and on south- and west-facing slopes and nearly level, open terrain: Red pine and eastern white pine.	For trees that are less than 30 feet tall at maturity: Amur maple, European mountain ash, flowering dogwood, oriental arborvitae, and blackgum. For trees that are 30 to 60 feet tall at maturity: American hornbean, Colorado blue spruce, Norway maple, green ash, and white birch. For trees that are more than 60 feet tall at maturity: Tulip tree, sweetgum, white fir, black cherry, sugar maple, and European beech.	Norway spruce, red pine, eastern white pine, white spruce, eastern redcedar, and Douglas-fir.
Group 2: Deep, somewhat poorly drained soils and shallow and moderately deep, well drained soils that have moderately slow to rapid permeability. 49, 172, 188, 293, 311B, 311D, 315A, 315B, 493, 501, 503A, 503B, 509A, 509B, and 740.	Red oak, white oak, eastern white pine, red pine, and green ash.	For trees that are less than 30 feet tall at maturity: European mountain ash, striped maple, mountain maple, amur maple, flowering dogwood, and redbud. For trees that are 30 to 60 feet tall at maturity: American hornbean, Norway maple, green ash, and American yellowwood. For trees that are more than 60 feet tall at maturity: Sugar maple, European beech, pin oak, white ash, white oak, sweetgum, and Chinese chestnut.	Eastern redcedar, Lombardy poplar, red pine, white spruce, Russian-olive, Douglas-fir, Norway spruce, and eastern white pine.
Group 3: Somewhat poorly drained and moderately well drained soils that have moderately slow and slow permeability. 146A, 146B, 189, 194B, 194C, 194C3, 194E2, 223B, 223C3, 295, 298A, 298B, 320A, 320B, 531B, 531C2, and 531C3.	On nearly level terrain and exposed south- and west-facing slopes: Sycamore, green ash, red maple, and red oak (northern). In sloping areas and on north- and east-facing slopes: Red oak, eastern white pine, red pine, and white oak.	For trees that are less than 30 feet tall at maturity: Oriental arborvitae, flowering dogwood, and crabapple. For trees that are 30 to 60 feet tall at maturity: Norway maple, green ash, black spruce, moraine locust, and eastern redcedar. For trees that are more than 60 feet tall at maturity: Red maple, white poplar, honeylocust (thornless), sweetgum, and European alder.	Eastern redcedar, Lombardy poplar, northern white-cedar, Russian-olive, red pine, Douglas-fir, and Norway spruce.
Group 4: Poorly drained and very poorly drained soils that are artificially drained. 69, 89, 125, R125, 201, 232, 235, 380, 516, 594, and 776.	Black walnut, red oak, white oak, cottonwood, sycamore, and green ash.	For trees and shrubs that are less than 30 feet tall at maturity: Flowering dogwood, crabapple and forsythia. For trees that are 30 to 60 feet tall at maturity: Weeping willow, gray birch, and aspen. For trees that are more than 60 feet tall at maturity: White poplar, red oak, red maple, white birch, and European larch.	Northern white-cedar, Lombardy poplar, speckled alder, Russian-olive, amur maple, autumn-olive, Norway spruce, and Douglas-fir.
Group 5: Poorly drained and very poorly drained depressional and bottom-land soils. 107, W201, and 330.	Pin oak, green ash, and red maple.	For trees and shrubs that are less than 30 feet tall at maturity: American cranberrybush and forsythia.	Black willow, cottonwood, eastern larch, black spruce, and arborvitae.

TABLE 5.—*Tree planting guide*—Continued

Tree planting group and map symbols	Forest trees	Ornamentals	Windbreak trees
Group 6: Somewhat excessively drained to excessively drained soils that have rapid and very rapid permeability. 88B, 98B, 741B, 741D, 741F, and 779B.	Eastern white pine and red pine.	For trees and shrubs that are less than 30 feet at maturity: Autumn-olive, spirea, and gray dogwood.	Red pine, eastern white pine, arborvitae, and Norway spruce.
Group 7: Very poorly drained organic soils that have rapid and moderately rapid permeability. 100 and 210.	Leave in natural state.	Leave in natural state.	Black willow, eastern larch, black spruce, and arborvitae.

be created or improved by planting appropriate vegetation, by properly managing the existing plant cover, and by fostering the natural establishment of desirable plants.

In table 6 the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in—

1. Planning the use of parks, wildlife refuges, nature study areas, and other developments for wildlife.
2. Selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat.
3. Determining the intensity of management needed for each element of the habitat.
4. Determining which areas to acquire for wildlife management.

Figure 9.—**Natural reseeding in a 22-year-old pine planting on Oakville fine sand.**

TABLE 6.—*Wildlife habitat potentials*

[See text for definitions of "good," "fair," "poor," and "very poor"]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for—		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Watseka: 49	Fair	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
Milford: 69	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Sparta: 88B	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Maumee: 89	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ade: 98B	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
Palms: 100	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Sawmill: 107	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
Selma:										
125	Good	Good	Good	Good	Poor	Good	Good	Good	Good	Good.
R125	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Alvin:										
131B	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
131C2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
131F	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Elliott:										
146A	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
146B	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Onarga: 150A, 150B	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Hoopeston: 172	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Beardstown: 188	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Martinton: 189	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Morley:										
194B	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
194C, 194C3	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
194E2	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Gilford:										
201	Fair	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Good.
W201	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Lena: 210	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Varna:										
223B	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
223C3	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Ashkum: 232	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Bryce: 235	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Plattville: 240A, 240B	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.

Andres: 293	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Symerton: 294A, 294B	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Mokena: 295	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Beecher:										
298A	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
298B	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ritchey: 311B, 311D	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
Channahon: 315A, 315B	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor.
Frankfort:										
320A	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
320B	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Peotone: 330	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Fieldon: 380	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Jasper: 440A, 440B	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Bonfield: 493	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Kankakee: 494A, 494B	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Morocco: 501	Poor	Fair	Good	Fair	Fair	Fair	Very poor	Fair	Fair	Poor.
Rockton: 503A, 503B	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Whalan: 509A, 509B	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Faxon: 516	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Fair	Poor	Poor.
Markham:										
531B	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
531C2, 531C3	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Reddick: 594	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Darroch: 740	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Oakville:										
741B	Poor	Poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor.
741D	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
741F	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Comfrey: 776	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Chelsea: 779B	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.

The potential of the soil is rated *good, fair, poor,* or *very poor.* A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, sorghum, wheat, oats, barley, millet, buckwheat, cowpeas, soybeans, and sunflowers. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are fescue, bluegrass, redtop, switchgrass, bromegrass, timothy, orchardgrass, clover, alfalfa, trefoil, and crown vetch. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established herbaceous grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiangrass, goldenrod, beggarweed, pokeweed, partridgepea, wheatgrass, tickclover, and ragweed. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, persimmon, sassafras, sumac, hickory, hazlenut, black walnut, blackberry, grape, blackhaw, viburnum, blueberry, bayberry, and briers. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Examples are pine, spruce, hemlock, fir, yew, cedar, and juniper. Major soil properties that affect the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, rushes, sedges, reeds, wildrice, saltgrass, cordgrass, and cattail. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

Shallow water areas are bodies of surface water that have an average depth of less than 5 feet and are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control devices in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of croplands, pastures, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, killdeer, cottontail rabbit, red fox, and woodchuck.

Woodland habitat consists of hardwoods or conifers or a mixture of both, with associated grasses, legumes, and wild herbaceous plants. Examples of wildlife attracted to this habitat are wild turkey, ruffed grouse, woodcock, thrushes, vireos, woodpeckers, tree squirrels, grey fox, raccoon, deer, elk, and black bear.

Wetland habitat consists of water-tolerant plants in open, marshy, or swampy shallow water areas. Examples of wildlife attracted to this habitat are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction materials, and engineering properties. Among those who can benefit from this section are engineers, landowners, community decision makers and planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in tables in this section are based on test data and estimated data. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by the soil survey and used in determining the ratings in this section are grain-size distribution, liquid limit, plasticity index, soil reaction, depth to and hardness of bedrock within 5 or 6 feet of the surface, soil wetness characteristics, depth to a seasonal water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

Based on the information assembled about soil properties, ranges of values may be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values may be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to—(1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternate routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternate sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations and testing.

The information is presented mainly in tables. Table 7 shows for each kind of soil, ratings of the degree and kind of limitations for building site development. Table 8 shows the suitability of each kind of soil as a source of construction materials. Table 9 shows the engineering properties and classification of the soils. Table 10 shows the physical and chemical properties of soils and table 11, soil and water features. Table 12 shows the suitability of soils for sanitary facilities.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have different meanings in soil science and in engineering; the Glossary defines many of these terms.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 7. A *slight* limitation indicates that soil properties are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by the soil wetness of a high seasonal water table, the texture and consistence of soils, the tendency of soils to cave in or slough, and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and small commercial buildings referred to in table 7 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soil should be sufficiently stable that cracking or subsidence from settling or shear failure of the foundation do not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were

TABLE 7.—*Building site development*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Watseka: 49	Severe: wetness, cutbanks cave.	Moderate: wetness	Severe: wetness	Moderate: wetness	Moderate: wetness, frost action.
Milford: 69	Severe: wetness	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, wetness, shrink-swell.
Sparta: 88B	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Maumee: 89	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Ade: 98B	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Palms: 100	Severe: wetness, excess humus, cutbanks cave.	Severe: wetness, frost action, excess humus.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, low strength.
Sawmill: 107	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness. floods.	Severe: wetness, frost action, low strength.
Selma:					
125	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, frost action.
R125	Severe: wetness, depth to rock.	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness, frost action.
Alvin:					
131B	Slight	Slight	Slight	Slight	Moderate: frost action.
131C2	Slight	Slight	Slight	Moderate: slope	Moderate: frost action.
131F	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Elliott: 146A, 146B	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action.
Onarga: 150A, 150B	Slight	Slight	Slight	Slight	Moderate: frost action, low strength.
Hoopeston: 172	Severe: wetness, cutbanks cave.	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action.
Beardstown: 188	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action.
Martinton: 189	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action.
Morley:					
194B	Moderate: too clayey, wetness.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, wetness, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
194C	Moderate: too clayey, wetness.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, wetness, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength.
194E2	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength, slope.
194C3	Moderate: too clayey, slope.	Moderate: shrink-swell, low strength, slope.	Moderate: shrink-swell, wetness, low strength.	Severe: slope	Severe: low strength.
Gilford: 201, W201	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness, frost action.
Lena: 210	Severe: wetness, floods.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: frost action, wetness.

TABLE 7.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Varna:					
223B	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: wetness, shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength, frost action.
223C3	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: wetness, shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength, frost action.
Ashkum: 232	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action.
Bryce: 235	Severe: wetness, too clayey.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action.
Plattville: 240A, 240B	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.
Andres: 293	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action.
Symerton: 294A, 294B	Moderate: wetness	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, wetness, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Mokena: 295	Severe: wetness, too clayey.	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.
Beecher: 298A, 298B	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.
Ritchey: 311B, 311D	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Channahon: 315A, 315B	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Frankfort:					
320A	Severe: wetness, too clayey.	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.
320B	Severe: wetness, too clayey.	Moderate: wetness, shrink-swell.	Severe: wetness	Moderate: wetness, shrink-swell, slope.	Severe: frost action, low strength.
Peotone: 330	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, frost action, shrink-swell.
Fieldon: 380	Severe: wetness, cutbanks cave.	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness, frost action.
Jasper: 440A, 440B	Slight	Slight	Slight	Slight	Moderate: frost action.
Bonfield: 493	Severe: wetness, large stones.	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action.
Kankakee: 494A, 494B	Severe: large stones.	Slight	Slight	Slight	Moderate: frost action.
Morocco: 501	Severe: cutbanks cave, wetness.	Moderate: wetness	Severe: wetness	Moderate: wetness	Moderate: wetness, frost action.
Rockton: 503A, 503B	Severe: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: frost action.
Whalan: 509A, 509B	Severe: depth to rock.	Slight	Severe: depth to rock.	Slight	Moderate: depth to rock.
Faxon: 516	Severe: wetness, floods, depth to rock.	Severe: wetness, floods, frost action.	Severe: wetness, floods, depth to rock.	Severe: wetness, floods, depth to rock.	Severe: wetness, floods, frost action.

TABLE 7.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Markham:					
531B	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: wetness, low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.
531C2, 531C3	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: wetness, low strength, shrink-swell.	Moderate: shrink-swell, low strength, slope.	Severe: frost action, low strength.
Reddick: 594	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness, frost action.
Darroch: 740	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action.
Oakville:					
741B	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
741D	Severe: cutbanks cave.	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope.
741F	Severe: cutbanks cave, slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Comfrey: 776	Severe: wetness, floods.	Severe: wetness, floods, frost action.	Severe: wetness, floods.	Severe: wetness, floods, frost action.	Severe: wetness, floods, frost action.
Chelsea: 779B	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.

also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and the large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets referred to in table 7 have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The AASHTO and Unified classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones, all of which affect stability and ease of excavation, were also considered.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 8 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed and described as the survey is made, generally about 6 feet.

Roadfill is soil material used in embankments for roads. The ratings reflect the ease of excavating and working the material and the expected performance of the material after it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about soil properties that determine such performance is given in the descriptions of soil series.

The ratings apply to the soil profile between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within the profile. The estimated engineering properties in table 9 provide more specific information about the nature of each horizon that can help determine its suitability for roadfill.

According to the Unified soil classification system, soils rated *good* have low shrink-swell potential, low potential frost action, and few cobbles and stones (*2*). They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as high shrink-swell potential, high potential frost action, steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*, regardless of the quality of the suitable material.

TABLE 8.—*Construction materials*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor"]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Watseka: 49	Fair: wetness	Fair: excess fines	Unsuited	Poor: too sandy.
Milford: 69	Poor: frost action, shrink-swell, low strength.	Unsuited	Unsuited	Poor: wetness.
Sparta: 88B	Good	Good	Unsuited	Poor: too sandy.
Maumee: 89	Poor: wetness	Fair: excess fines	Unsuited	Poor: wetness.
Ade: 98B	Good	Fair: excess fines	Unsuited	Poor: too sandy.
Palms: 100	Poor: wetness, excess humus	Unsuited	Unsuited	Poor: wetness.
Sawmill: 107	Poor: wetness, frost action, low strength.	Unsuited	Unsuited	Poor: wetness.
Selma: 125, R125	Poor: wetness, frost action	Unsuited	Unsuited	Poor: wetness, area reclaim.
Alvin:				
131B, 131C2	Fair: frost action	Fair: excess fines	Unsuited	Good.
131F	Fair: frost action, slope	Fair: excess fines	Unsuited	Poor: slope.
Elliott: 146A, 146B	Poor: frost action	Unsuited	Unsuited	Fair: thin layer.
Onarga: 150A, 150B	Moderate: frost action, low strength.	Poor: excess fines	Unsuited	Good.
Hoopeston: 172	Poor: frost action	Fair: excess fines	Unsuited	Good.
Beardstown: 188	Poor: frost action	Poor: excess fines	Unsuited	Fair: thin layer.
Martinton: 189	Poor: frost action	Unsuited	Unsuited	Good.
Morley:				
194B, 194C	Poor: low strength	Unsuited	Unsuited	Fair: thin layer.
194E2	Poor: low strength	Unsuited	Unsuited	Poor: slope.
194C3	Poor: low strength	Unsuited	Unsuited	Fair: thin layer, slope.
Gilford: 201, W201	Poor: wetness, frost action	Fair	Unsuited	Poor: wetness.
Lena: 210	Poor: low strength, excess humus, wetness.	Unsuited	Unsuited	Poor: wetness.
Varna: 223B, 223C3	Poor: frost action, low strength	Unsuited	Unsuited	Fair: thin layer.
Ashkum: 232	Poor: frost action, wetness	Unsuited	Unsuited	Poor: wetness, too clayey.
Bryce: 235	Poor: frost action, wetness	Unsuited	Unsuited	Poor: too clayey.
Plattville: 240A, 240B	Fair: frost action, shrink-swell, area reclaim.	Unsuited	Unsuited	Fair: thin layer, area reclaim.
Andres: 293	Poor: frost action	Unsuited	Unsuited	Good.
Symerton: 294A, 294B	Poor: low strength	Unsuited	Unsuited	Fair: thin layer.
Mokena: 295	Poor: frost action, low strength	Unsuited	Unsuited	Fair: thin layer.
Beecher: 298A, 298B	Poor: frost action, low strength	Unsuited	Unsuited	Fair: thin layer.
Ritchey: 311B, 311D	Poor: thin layer	Unsuited	Unsuited	Poor: area reclaim.
Channahon: 315A, 315B	Poor: thin layer	Unsuited	Unsuited	Poor: thin layer.
Frankfort: 320A, 320B	Poor: frost action, low strength	Unsuited	Unsuited	Fair: thin layer.
Peotone: 330	Severe: shrink-swell, frost action	Unsuited	Unsuited	Poor: wetness, too clayey.
Fieldon: 380	Poor: wetness, frost action	Fair: excess fines	Unsuited	Poor: wetness.
Jasper: 440A, 440B	Fair: frost action	Unsuited	Unsuited	Good.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Bonfield: 493	Poor: frost action, area reclaim	Poor: excess fines	Poor: excess fines	Poor: area reclaim.
Kankakee: 494A, 494B	Fair: frost action	Poor: excess fines	Poor: excess fines	Poor: area reclaim.
Morocco: 501	Moderate: frost action	Fair: excess fines	Unsuited	Poor: too sandy.
Rockton: 503A, 503B	Fair: thin layer	Unsuited	Unsuited	Good.
Whalan: 509A, 509B	Fair: thin layer	Unsuited	Unsuited	Fair: thin layer.
Faxon: 516	Poor: wetness, excess humus, frost action.	Unsuited	Unsuited	Poor: wetness.
Markham: 531B, 531C2, 531C3.	Poor: frost action, low strength	Unsuited	Unsuited	Fair: thin layer.
Reddick: 594	Poor: wetness, frost action	Unsuited	Unsuited	Poor: wetness.
Darroch: 740	Poor: frost action	Unsuited	Unsuited	Good.
Oakville:				
741B, 741D	Good	Good	Unsuited	Poor: too sandy.
741F	Fair: slope	Good	Unsuited	Poor: too sandy, slope.
Comfrey: 776	Poor: wetness, frost action	Unsuited	Unsuited	Poor: wetness.
Chelsea: 779B	Good	Fair: excess fines	Unsuited	Poor: too sandy.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 9.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to sustain the growth of plants. Also considered is the damage that would result to the area from which the topsoil is taken.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones, are low in content of gravel and other coarse fragments, and have gentle slopes. They are low in soluble salts, which can limit plant growth. They are naturally fertile or respond well to fertilization. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils, very firm clayey soils, soils with suitable layers less than 8 inches thick, soils having large amounts of gravel, stones or soluble salt, steep soils, and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is much preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter. Consequently, careful preservation and use of material from these horizons is desirable.

Engineering properties

Table 9 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area. These estimates are presented as ranges in values most likely to exist in areas where the soil is mapped.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Information is presented for each of these contrasting horizons. Depth to the upper and lower boundaries of each horizon in a typical profile of each soil is indicated. More information about the range in depth and in properties of each horizon is given for each soil series in "Descriptions of the Soils."

Texture is described in table 9 in standard terms used by the United States Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains

TABLE 9.—*Engineering properties and classifications*

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number— 4	10	40	200	Liquid limit	Plasticity index
	In				*Pct*					*Pct*	
Watseka: 49	0–10	Loamy fine sand	SM	A-2	0	100	95–100	80–100	17–35	<25	NP–5
	10–60	Fine sand, sand, loamy fine sand.	SP, SM	A-3, A-2	0	90–100	90–100	60–80	3–25		NP
Milford: 69	0–16	Silty clay loam	CL, CH	A-7	0	100	95–100	90–100	80–95	40–60	20–35
	16–47	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95–100	90–100	75–100	40–60	20–40
	47–60	Stratified clay to sandy loam	CL	A-6, A-7	0	97–100	95–100	90–100	70–100	30–50	15–30
Sparta: 88B	0–20	Loamy fine sand	SM, SP–SM	A-2	0	100	100	60–70	10–20		NP
	20–60	Sand	SP	A-3	0	100	100	65–75	1–5		NP
Maumee: 89	0–18	Loamy fine sand	SM	A-2-4, A-2-5	0	95–100	90–100	65–85	20–30	<30	NP–5
	18–60	Sand	SP, SP–SM	A-1-B, A-3	0	85–100	75–95	18–60	3–10	<30	NP
Ade: 98B	0–14	Loamy fine sand	SM	A-2-4	0	100	100	65–80	10–35		NP
	14–66	Fine sand, loamy fine sand	SP, SM	A-3, A-2-4	0	100	100	65–80	3–15		NP
Palms: 100	0–37	Muck	Pt								
	37–60	Clay loam, loam, silt loam, sandy loam.	CL–ML, CL	A-4, A-6	0	85–100	80–100	70–95	50–80	<30	5–15
Sawmill: 107	0–53	Silty clay loam	CL	A-6, A-7	0	100	100	95–100	80–100	30–50	15–30
	53–60	Stratified silty clay loam to loam.	CL	A-4, A-6, A-7	0	100	100	95–100	70–100	25–45	8–30
Selma: 125	0–14	Loam	SC, CL	A-4, A-6	0	100	98–100	90–100	35–70	26–35	7–17
	14–38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	95–100	90–100	38–75	24–36	11–19
	38–60	Stratified sand to silt loam	CL, SC, SM, ML	A-4, A-6, A-2	0	90–100	85–100	65–100	18–67	<35	NP–21
R125	0–14	Loam	SC, CL	A-4, A-6	0	100	98–100	90–100	35–70	26–35	7–17
	14–40	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	100	95–100	90–100	38–75	24–36	11–19
	40	Unweathered bedrock.									
Alvin: 131B, 131C2, 131F.	0–12	Sandy loam	SM, ML	A-4, A-2	0	100	100	80–95	30–60	15–28	NP–4
	12–44	Fine sandy loam, clay loam, sandy clay loam.	SC, CL, SM	A-4, A-6, A-2	0	100	100	90–100	20–80	15–38	NP–13
	44–64	Stratified sandy loam to fine sand.	SP–SM, SM	A-2, A-3	0–5	95–100	90–100	70–95	4–35	10–20	NP–4
Elliott: 146A, 146B	0–14	Silt loam	CL	A-6, A-7	0	95–100	95–100	95–100	80–99	35–50	12–18
	14–41	Silty clay, silty clay loam	CH, CL	A-6, A-7	0–5	95–100	95–100	90–100	75–99	30–52	11–26
	41–60	Silty clay loam, clay loam	CL	A-6, A-7	0–5	95–100	95–100	90–100	70–95	28–45	11–24
Onarga: 150A, 150B	0–12	Fine sandy loam	SC, SM	A-2, A-4, A-6	0	100	100	75–95	25–50	5–28	NP–12
	12–29	Fine sandy loam, loam, sandy clay loam.	SC, CL, SM–SC, CL–ML	A-4, A-6	0	95–100	95–100	75–95	36–60	19–32	5–14
	29–60	Stratified sand to sandy loam	SM	A-2, A-4	0	85–100	80–100	70–95	12–50	<20	NP–6

TABLE 9.—*Engineering properties and classifications*—Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				*Pct*					*Pct*	
Hoopeston: 172	0–46	Fine sandy loam	SM, SC	A-2, A-4	0	90–100	90–100	70–90	25–45	20–40	5–10
	46–60	Loamy fine sand to sand	SP-SM, SM, SC	A-2, A-3	0	90–100	90–100	50–80	5–20	<25	NP–10
Beardstown: 188	0–14	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	80–95	50–65	20–30	5–15
	14–50	Loam, silty clay loam, loamy fine sand.	CL, SC	A-6, A-4	0	100	100	80–90	40–60	25–35	7–15
	50–60	Stratified sand to loam	SM	A-2, A-4	0	100	100	20–50	15–45	<15	NP–5
Martinton: 189	0–13	Silt loam	CL	A-6, A-7	0	95–100	95–100	90–100	75–95	34–49	13–19
	13–37	Silty clay loam, silty clay	CH, CL	A-7	0	95–100	95–100	90–100	70–95	41–55	15–32
	37–60	Stratified sandy loam to silty clay loam.	CL, ML, SM	A-4, A-6, A-7	0	95–100	95–100	90–100	35–90	25–50	NP–25
Morley:											
194B, 194C, 194E2	0–8	Silt loam	CL	A-6, A-4	0–5	95–100	95–100	90–100	85–95	25–40	5–15
	8–29	Silty clay loam	CL	A-6	0–10	95–100	90–100	85–95	80–90	25–40	10–20
	29–36	Silty clay, clay loam, clay	CH, CL	A-7, A-6	0–10	95–100	90–100	85–95	80–90	30–55	15–30
	36–60	Silty clay loam, clay loam	CL	A-6, A-7	0–10	95–100	90–100	85–95	80–90	30–45	15–25
194C3	0–8	Silty clay loam	CL	A-6	0–5	95–100	95–100	90–100	85–95	25–40	10–20
	8–29	Silty clay loam	CL	A-6	0–10	95–100	90–100	85–95	80–90	25–40	10–20
	29–36	Silty clay, clay loam, clay	CH, CL	A-7, A-6	0–10	95–100	90–100	85–95	80–90	30–55	15–30
	36–60	Silty clay loam, clay loam	CL	A-6, A-7	0–10	95–100	90–100	85–95	80–90	30–45	15–25
Gilford: 201, W201	0–16	Fine sandy loam	SM, SC, SM-SC	A-4	0	95–100	90–100	65–80	35–45	16–22	2–10
	16–31	Fine sandy loam, sandy clay loam, loam.	SM, SC, SM-SC	A-2-4	0	90–100	90–100	55–70	25–35	20–30	2–8
	31–60	Loamy fine sand to sand	SM, SP, SP-SM	A-3, A-1-B	0	90–100	85–100	18–60	3–18		NP
Lena: 210	0–72	Muck	Pt		0						
Varna: 223B, 223C3	0–12	Silt loam	CL	A-6, A-4	0–5	95–100	95–100	95–100	85–95	25–40	8–20
	12–30	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0–10	95–100	95–100	90–98	80–98	33–56	15–29
	30–60	Silty clay loam, clay loam	CL	A-7, A-6	0–10	95–100	95–100	90–98	80–95	30–45	13–26
Ashkum: 232	0–34	Silty clay loam	CL, CH	A-7	0	100	98–100	95–100	75–100	45–65	20–35
	34–60	Silty clay loam	CL	A-7, A-6	0–5	98–100	95–100	90–100	75–95	35–50	15–30
Bryce: 235	0–11	Silty clay	CH, CL	A-7	0	100	100	95–100	80–100	45–60	20–31
	11–40	Silty clay, clay	CH, CL	A-7	0–5	100	100	95–100	85–100	47–62	25–40
	40–60	Silty clay, silty clay loam, clay.	CH, CL	A-7, A-6	0–5	100	95–100	95–100	70–95	35–60	21–38
Plattville: 240A, 240B	0–14	Silt loam	CL	A-4, A-6	0	100	100	95–100	90–100	30–40	8–20
	14–27	Loam, clay loam, sandy clay loam.	CL	A-6, A-7	0	100	100	95–100	90–100	35–50	11–25
	27–44	Loam, clay loam, sandy clay loam.	CL	A-6, A-7	0–5	95–100	90–100	85–100	80–95	35–50	11–25
	44	Unweathered bedrock.									

Andres: 293	0–14	Silt loam	CL	A-7, A-6	0	95–100	95–100	90–99	80–94	35–45	11–20
	14–42	Silty clay loam, clay loam, sandy clay loam.	CL, CH	A-7	0–5	95–100	95–100	95–100	80–99	41–56	16–32
	42–60	Silty clay loam	CL	A-6, A-7	0–5	95–100	95–100	85–100	70–95	28–48	11–26
Symerton: 294A, 294B	0–13	Silt loam	CL, ML	A-7, A-6	0	95–100	95–100	90–100	60–95	35–50	11–20
	13–34	Sandy clay loam, clay loam, silty clay loam.	CL, CH	A-7, A-6	0–5	98–100	95–100	95–100	70–85	30–57	15–32
	34–60	Silty clay loam	CL	A-7, A-6	0–10	95–100	95–100	85–100	75–85	30–45	13–26
Mokena: 295	0–15	Loam	CL	A-6, A-7	0	95–100	95–100	85–100	75–90	31–45	11–24
	15–37	Clay loam, silty clay loam	CL	A-7, A-6	0	95–100	95–100	85–100	80–95	36–47	13–26
	37–60	Silty clay, clay	CH, CL	A-7, A-6	0–5	95–100	90–100	85–100	75–95	35–55	14–31
Beecher: 298A, 298B	0–13	Silt loam	CL, ML	A-6, A-4, A-7	0	95–100	95–100	90–100	85–95	30–45	10–20
	13–32	Silty clay, silty clay loam	CL	A-6, A-7	0	95–100	95–100	90–100	85–95	35–50	15–26
	32–60	Silty clay loam, clay loam	CL	A-6	0–5	90–100	90–100	85–95	80–90	28–40	10–20
Ritchey: 311B, 311D	0–6	Silt loam	ML, CL	A-4, A-6	0	95–100	95–100	90–100	70–95	20–35	1–15
	6–16	Clay loam	CL	A-6	0–35	95–100	95–100	90–100	65–90	25–40	10–20
	16	Unweathered bedrock.									
Channahon: 315A, 315B.	0–8	Silt loam	CL	A-6, A-4	0–20	95–100	95–100	85–100	65–90	21–38	7–18
	8–16	Loam, sandy clay loam, silty clay loam.	CL	A-6, A-7	0–20	95–100	90–100	85–100	50–85	20–35	10–20
	16	Unweathered bedrock.									
Frankfort: 320A, 320B	0–8	Silt loam	CL	A-6, A-7	0	100	98–100	90–98	75–95	34–45	11–19
	8–60	Silty clay	CH, CL	A-7	0–5	95–100	95–100	90–100	60–95	41–54	14–28
Peotone: 330	0–17	Silty clay loam	OH, CH, CL	A-7	0	100	95–100	95–100	80–100	41–65	18–35
	17–44	Silty clay loam, silty clay	CH, CL	A-7	0–5	100	95–100	90–100	85–100	41–70	17–39
	44–60	Silty clay loam	CL, CH	A-7, A-6	0–5	95–100	95–100	90–100	75–98	30–60	14–29
Fieldon: 380	0–19	Loam	CL–ML	A-4	0	100	100	85–95	50–75	20–35	5–10
	19–48	Fine sandy loam, very fine sandy loam, loam.	ML, SM	A-4	0	100	100	70–90	35–60	<30	NP–5
	48–60	Fine sand, loamy fine sand	SM, SP–SM	A-2, A-3	0	100	100	75–85	5–35		NP
Jasper: 440A, 440B	0–15	Silt loam	CL, CL–ML	A-4, A-6	0	100	100	90–100	70–90	25–35	5–15
	15–22	Loam	CL	A-6	0	100	100	85–95	60–75	20–35	10–20
	22–45	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-6	0	100	100	80–95	45–85	20–35	10–20
	45–60	Sandy loam and sand	SC, SM–SC	A-4, A-2-4	0	100	100	60–70	30–40	20–30	5–10
Bonfield: 493	0–20	Loam	SM–SC, SC, CL–ML	A-4, A-2, A-6	0–10	70–95	55–75	50–70	30–55	15–40	5–15
	20–60	Very cobbly fine sandy loam, very cobbly loam, cobbly fine sandy loam.	SM–SC, SC, SM	A-2	30–80	70–90	45–70	25–60	10–35	15–40	5–10
Kankakee: 494A, 494B	0–21	Fine sandy loam, sandy clay loam.	SM–SC, SC	A-4, A-2, A-6	0–10	70–95	55–75	50–70	30–50	15–40	5–15
	21–60	Very cobbly loam, very cobbly fine sandy loam.	SM–SC, SC, SM	A-2, A-1	30–80	70–90	45–70	25–60	10–35	15–40	5–10
Morocco: 501	0–10	Fine sand	SM	A-2-4	0	100	100	65–80	20–35	<10	NP–5
	10–60	Fine sand, sand	SM, SP–SM	A-3, A-2-4	0	100	80–90	50–70	5–25		NP
Rockton: 503A, 503B	0–13	Loam	ML, CL–ML	A-4	0	90–100	90–100	85–95	50–75	25–35	5–10
	13–30	Clay, clay loam, silty clay	CH, CL, MH	A-7	0–2	90–100	90–100	90–95	70–90	40–60	20–30
	30	Weathered bedrock.									
Whalan: 509A, 509B	0–11	Very fine sandy loam, loam	CL	A-6	0	95–100	95–100	80–95	70–90	30–40	10–15
	11–28	Clay loam, loam, sandy loam	CL, CH, MH	A-7	0–2	90–100	80–95	80–90	60–75	40–60	20–30
	28	Weathered bedrock.									

TABLE 9.—*Engineering properties and classifications*—Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments >3 inches	Percentage passing sieve number—				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				*Pct*					*Pct*	
Faxon: 516	0–17	Clay loam	OL, CL, ML	A-7	0–10	95–100	90–100	85–100	80–95	40–50	15–25
	17–28	Loam, clay loam, sandy clay loam.	CL, ML, SC	A-7, A-6	0–10	95–100	90–100	70–95	50–85	30–50	10–20
	28	Unweathered bedrock.									
Markham: 531B, 531C2	0–10	Silt loam	CL, CL-ML	A-6, A-4	0–5	95–100	95–100	90–100	85–95	23–40	6–17
	10–39	Silty clay, silty clay loam	CL, CH	A-7, A-6	0–10	95–100	90–100	85–100	80–90	30–54	15–28
	39–60	Silty clay loam, clay loam	CL	A-7, A-6	0–10	95–100	90–100	85–95	80–90	30–45	13–26
531C3	0–10	Silty clay loam	CL, CL-ML	A-6, A-4	0–5	95–100	95–100	90–100	85–95	23–40	6–17
	10–39	Silty clay, silty clay loam	CL, CH	A-7	0–10	95–100	90–100	85–100	80–90	30–54	15–28
	39–60	Silty clay loam, clay loam	CL	A-7, A-6	0–10	95–100	90–100	85–95	80–90	30–45	13–26
Reddick: 594	0–13	Clay loam	CL	A-6, A-7	0	95–100	85–95	85–95	75–90	30–50	10–25
	13–32	Clay loam, silty clay loam	CL	A-6, A-7	0–5	95–100	80–90	80–90	65–90	30–50	10–25
	32–60	Silty clay loam, clay loam, clay.	CL, CH	A-6, A-7	0–10	95–100	90–100	85–95	80–95	35–55	15–30
Darroch: 740	0–14	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90–100	70–90	25–35	5–15
	14–34	Clay loam	CL	A-6, A-7	0	100	100	90–100	70–80	35–50	15–25
	34–60	Stratified fine sand to silt	SC, CL-ML, CL, SM-SC	A-4	0	100	100	75–90	35–85	<30	5–10
Oakville: 741B, 741D, 741F.	0–7	Fine sand	SM	A-2	0	100	100	70–85	20–35		NP
	7–60	Fine sand	SM	A-2	0	100	95–100	70–95	15–25		NP
Comfrey: 776	0–26	Clay loam, silt loam	OL, OH, MH, ML	A-7	0	100	100	85–98	65–85	45–60	12–20
	26–60	Clay loam, loam	CL	A-7, A-6	0	100	100	80–98	60–85	35–50	12–25
Chelsea: 779B	0–5	Fine sand	SM	A-2-4	0	100	100	65–80	10–35		NP
	5–60	Fine sand	SP, SM	A-3, A-2-4	0	100	100	65–80	3–15		NP

gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms used by USDA are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System and the classification system of the American Association of State Highway and Transportation Officials (AASHTO) (*1*, *2*). In table 9 soils in the survey area are classified according to both systems.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example CL-ML.

The AASHTO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified as one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified as A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or more for the poorest. The estimated classification, without group index numbers, is given in table 9. Also in table 9 the percentage, by weight, of cobbles or the rock fragments more than 3 inches in diameter are estimated for each major horizon. These estimates are determined largely by observing volume percentage in the field and then converting it, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four standard sieves is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistency of soil. These indexes are used in both the Unified and the AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior.

Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

Physical and chemical properties

Table 10 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the representative profile of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships between the soil characteristics observed in the field — particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for water movement in a vertical direction when the soil is saturated. Not considered in the estimates are lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in the planning and design of drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops and ornamental or other plants to be grown, in evaluating soil amendments for fertility and stabilization, and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. Salinity affects the suitability of a soil for crops, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others it was estimated on the basis of the kind of clay and on measurements of similar soils. Size of imposed loadings and the magnitude of changes in soil moisture content are also important factors that influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A *high* shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion, as used in table 10, pertains to

TABLE 10.—*Physical and chemical properties*

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*						
Watseka: 49	0–10	6.0–20	0.07–0.12	6.1–7.3	<2	Very low	Low	Moderate			2
	10–60	6.0–20	0.05–0.10	5.1–7.3	<2	Very low	Low	High			
Milford: 69	0–16	0.6–2.0	0.12–0.23	6.1–7.3	<2	High	High	Low			4
	16–47	0.2–0.6	0.11–0.20	6.6–7.8	<2	High	High	Low			
	47–60	0.2–0.6	0.14–0.20	7.4–8.4	<2	Moderate	High	Low			
Sparta: 88B	0–20	>20	0.12–0.14	5.6–6.0	<2	Low	Low	Low	0.17	5	2
	20–60	>20	0.06–0.08	5.6–6.0	<2	Low	Low	Low	0.17		
Maumee: 89	0–18	6.0–20	0.10–0.12	6.1–6.5	<2	Low	High	Moderate			2
	18–60	>20	0.05–0.07	6.1–7.8	<2	Low	High	Moderate			
Ade: 98B	0–14	6.0–20	0.10–0.12	5.1–6.5	<2	Low	Low	High	0.17	5	2
	14–66	6.0–20	0.06–0.08	5.1–6.0	<2	Low	Low	High	0.17		
	35–60	6.0–20	0.06–0.08	5.1–6.0	<2	Low	Low	High	0.17		
	60–70	6.0–20	0.06–0.08	6.1–8.4	<2	Low	Low	High	0.17		
Palms: 100	0–37	0.2–6.0	0.35–0.45	5.1–7.8	<2		High	Moderate			3
	37–60	0.6–2.0	0.05–0.19	6.1–8.4	<2	Low	High	Low			
Sawmill: 107	0–53	0.2–2.0	0.18–0.23	6.1–7.8	<2	Moderate	High	Low			7
	53–60	0.2–2.0	0.11–0.20	7.4–8.4	<2	Moderate	High	Low			
Selma:											
125	0–14	0.6–2.0	0.17–0.22	6.1–7.8	<2	Moderate	High	Low			6
	14–38	0.6–2.0	0.15–0.19	6.1–7.8	<2	Moderate	High	Low			
	38–60	0.6–6.0	0.05–0.22	6.1–7.8	<2	Low	High	Low			
R125	0–14	0.6–2.0	0.17–0.22	6.1–7.8	<2	Moderate	High	Low			6
	14–38	0.6–2.0	0.15–0.19	6.1–7.8	<2	Moderate	High	Low			
	38										
Alvin: 131B, 131C2, 131F	0–12	2.0–6.0	0.14–0.20	5.1–6.5	<2	Low	Low	High	0.24	5	3
	12–44	2.0–6.0	0.12–0.20	4.5–6.0	<2	Low	Low	High	0.24		
	44–64	6.0–20	0.05–0.13	5.1–7.8	<2	Low	Low	High	0.24		
Elliott: 146A, 146B	0–14	0.6–2.0	0.21–0.24	5.6–6.5	<2	Moderate	High	Moderate	0.32	4	6
	14–41	0.2–0.6	0.11–0.20	5.6–7.8	<2	Moderate	High	Moderate	0.32		
	41–60	0.2–0.6	0.14–0.20	7.4–8.4	<2	Moderate	High	Low	0.32		
Onarga: 150A, 150B	0–12	0.6–2.0	0.13–0.22	5.6–6.5	<2	Low	Low	Moderate	0.20	4–3	3
	12–29	0.6–2.0	0.15–0.19	5.1–6.5	<2	Low	Low	High	0.20		
	29–60	6.0–20	0.05–0.13	5.1–7.8	<2	Low	Low	High	0.15		
Hoopeston: 172	0–46	2.0–6.0	0.12–0.15	5.1–6.5	<2	Low	Moderate	High			3
	46–60	6.0–20	0.05–0.10	5.6–7.8	<2	Very low	Low	Moderate			
Beardstown: 188	0–14	0.6–2.0	0.17–0.24	5.6–6.5	<2	Low	High	Moderate	0.28	5	5
	14–50	0.6–2.0	0.15–0.19	4.5–6.0	<2	Low	High	High	0.28		
	50–60	2.0–6.0	0.08–0.18	5.1–6.0	<2	Low	Moderate	Moderate	0.17		
Martinton: 189	0–13	0.6–2.0	0.22–0.24	5.1–6.5	<2	Low	High	Moderate	0.32	5	6
	13–37	0.2–0.6	0.11–0.20	5.6–7.8	<2	Moderate	High	Moderate	0.43		
	37–60	0.06–0.2	0.11–0.22	7.9–8.4	<2	Moderate	High	Low	0.43		

Morley: 194B, 194C, 194E2, 194C3.	0–8	0.6–2.0	0.20–0.24	5.1–6.5	<2	Low	Low	Moderate	0.43	3–2	6
	8–29	0.2–0.6	0.18–0.20	5.1–6.5	<2	Moderate	Moderate	Moderate	0.43		
	29–36	0.06–0.2	0.11–0.13	5.6–6.5	<2	Moderate	High	Moderate	0.43		
	36–60	0.2–0.6	0.18–0.20	6.6–8.4	<2	Moderate	Moderate	Low	0.43		
Gilford: 201, W201	0–16	2.0–6.0	0.16–0.18	6.1–6.5	<2	Low	High	Moderate			3
	16–31	2.0–6.0	0.12–0.14	6.1–6.5	<2	Low	High	Moderate			
	31–60	6.0–20	0.05–0.08	6.6–8.4	<2	Low	High	Low			
Lena: 210	0–72	0.2–6.0	0.35–0.45	7.4–8.4	<2		High	Low			3
Varna: 223B, 223C3	0–12	0.6–2.0	0.22–0.24	6.1–7.3	<2	Low	Moderate	Low	0.32	4–3	6
	12–30	0.2–0.6	0.09–0.19	5.6–6.5	<2	Moderate	Moderate	Moderate	0.32		
	30–60	0.06–0.6	0.14–0.20	6.6–8.4	<2	Low	Moderate	Low	0.32		
Ashkum: 232	0–34	0.2–0.6	0.12–0.23	5.6–7.8	<2	Moderate	High	Moderate			4
	34–60	0.2–0.6	0.18–0.20	6.1–8.4	<2	Moderate	High	Low			
Bryce: 235	0–11	0.2–0.6	0.12–0.23	5.6–7.8	<2	Moderate	High	Moderate			4
	11–40	0.06–0.2	0.09–0.13	6.6–8.4	<2	Moderate	High	Low			
	40–60	0.06–0.2	0.08–0.19	7.4–8.4	<2	Moderate	High	Low			
Plattville: 240A, 240B	0–14	0.6–2.0	0.20–0.24	6.1–7.3	<2	Low	Moderate	Low	0.32	4	6
	14–27	0.6–2.0	0.15–0.20	5.6–6.5	<2	Moderate	High	Moderate	0.32		
	27–44	0.6–2.0	0.15–0.19	6.1–7.8	<2	Moderate	High	Low	0.32		
	44										
Andres: 293	0–14	0.6–2.0	0.21–0.24	6.1–7.3	<2	Low	High	Low	0.28	5	6
	14–42	0.6–2.0	0.16–0.20	6.1–7.8	<2	Moderate	High	Low	0.28		
	42–60	0.2–0.6	0.18–0.20	7.9–8.4	<2	Moderate	High	Low	0.37		
Symerton: 294A, 294B	0–13	0.6–2.0	0.20–0.24	5.6–6.5	<2	Low	Low	Moderate	0.32	5–4	6
	13–34	0.6–2.0	0.16–0.20	5.6–7.8	<2	Moderate	Moderate	Moderate	0.32		
	34–60	0.2–0.6	0.18–0.20	7.4–8.4	<2	Moderate	Moderate	Low	0.43		
Mokena: 295	0–15	0.6–2.0	0.20–0.24	5.6–7.3	<2	Low	High	Moderate	0.28	4	6
	15–37	0.2–0.6	0.15–0.20	5.6–7.3	<2	Moderate	High	Moderate	0.28		
	37–60	0.06–0.2	0.08–0.12	6.6–8.4	<2	Moderate	High	Low	0.28		
Beecher: 298A, 298B	0–13	0.2–0.6	0.22–0.24	4.5–6.0	<2	Low	High	High	0.37	3–2	6
	13–32	0.06–0.2	0.11–0.19	4.5–6.5	<2	Moderate	High	High	0.37		
	32–60	0.06–0.2	0.14–0.20	7.4–8.4	<2	Moderate	High	Low	0.37		
Ritchey: 311B, 311D	0–6	0.6–2.0	0.22–0.24	5.6–7.8	<2	Low	Low	Low	0.37	2	6
	6–16	0.6–2.0	0.18–0.20	6.6–8.4	<2	Moderate	Moderate	Low	0.37		
	16										
Channahon: 315A, 315B	0–8	0.6–2.0	0.20–0.24	6.1–8.4	<2	Low	Low	Low	0.37	2–1	6
	8–16	0.6–2.0	0.15–0.22	6.1–8.4	<2	Moderate	Moderate	Low	0.37		
	16										
Frankfort: 320A, 320B	0–8	0.2–0.6	0.20–0.24	5.6–7.8	<2	Low	High	Moderate	0.37	3–2	6
	8–60	0.06–0.2	0.10–0.13	6.1–8.4	<2	Moderate	High	Low	0.37		
Peotone: 330	0–17	0.2–0.6	0.12–0.23	5.6–6.5	<2	High	High	Moderate			4
	17–44	0.2–0.6	0.11–0.20	6.1–7.8	<2	High	High	Low			
	44–60	0.06–0.2	0.18–0.20	6.6–8.4	<2	High	High	Low			
Fieldon: 380	0–19	0.6–2.0	0.18–0.20	7.4–7.8	<2	Low	Low	Low			4L
	19–48	0.6–2.0	0.15–0.17	7.4–7.8	<2	Low	Low	Low			
	48–60	6.0–20	0.05–0.07	7.4–7.8	<2	Low	Low	Low			
Jasper: 440A, 440B	0–15	0.6–2.0	0.20–0.24	5.1–6.5	<2	Low	Low	Moderate	0.28	5	5
	15–22	0.6–2.0	0.17–0.19	5.1–6.0	<2	Low	Low	Moderate	0.28		
	22–45	0.6–2.0	0.16–0.18	5.1–6.0	<2	Low	Moderate	Moderate	0.28		
	45–60	0.6–2.0	0.14–0.16	5.6–7.3	<2	Low	Low	Moderate	0.28		
	60–70	0.6–2.0	0.19–0.21	7.4–7.8	<2	Low	Low	Low	0.28		

TABLE 10.—*Physical and chemical properties*—Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	*In/hr*	*In/hr*	*pH*	*Mmhos/cm*						
Bonfield: 493	0–20	0.6–2.0	0.14–0.22	5.6–7.8	<2	Low	Low	Low	0.24	3	5
	20–60	2.0–6.0	0.08–0.11	6.1–8.4	<2	Low	Low	Low	0.15		
Kankakee: 494A, 494B	0–21	0.6–2.0	0.14–0.22	5.6–7.8	<2	Low	Low	Low	0.20	3	3
	21–60	2.0–6.0	0.08–0.11	6.1–8.4	<2	Low	Low	Low	0.15		
Morocco: 501	0–10	6.0–20	0.07–0.09	5.1–6.5	<2	Low	Low	High			1
	10–60	6.0–20	0.05–0.07	4.5–6.0	<2	Low	Low	High			
Rockton: 503A, 503B	0–13	0.6–2.0	0.20–0.22	5.1–6.5	<2	Low	Low	Low	0.28	4–3	6
	13–30	0.6–2.0	0.10–0.14	5.6–7.3	<2	High	Low	Low	0.28		
	30										
Whalan: 509A, 509B	0–11	0.6–2.0	0.17–0.19	5.1–6.5	<2	Moderate	Moderate	Low	0.32		
	11–28	0.6–2.0	0.15–0.19	5.1–7.8	<2	High	High	Moderate	0.32		
	28										
Faxon: 516	0–17	0.6–2.0	0.17–0.22	6.6–7.8	<2	Moderate	High	Low			6
	17–28	0.6–2.0	0.12–0.19	6.6–7.8	<2	Moderate	High	Low			
	28										
Markham: 531B, 531C2, 531C3	0–10	0.6–2.0	0.22–0.24	5.6–6.5	<2	Low	Low	Moderate	0.37	3–2	6
	10–39	0.2–0.6	0.11–0.20	5.1–7.8	<2	Moderate	Moderate	Moderate	0.37		
	39–60	0.06–0.6	0.14–0.20	7.4–8.4	<2	Low	Moderate	Low	0.37		
Reddick: 594	0–13	0.6–2.0	0.17–0.23	7.4–7.8	<2	Moderate	High	Low			7
	13–32	0.6–2.0	0.15–0.20	7.4–7.8	<2	Moderate	High	Low			
	32–60	<0.2	0.08–0.20	7.9–8.4	<2	Moderate	High	Low			
Darroch: 740	0–14	0.6–2.0	0.20–0.24	4.5–7.3	<2	Low	High	High			5
	14–34	0.2–0.6	0.15–0.19	4.5–6.5	<2	Moderate	High	High			
	34–60	0.6–2.0	0.19–0.21	7.9–8.4	<2	Low	High	Low			
Oakville: 741B, 741D, 741F	0–7	>20	0.07–0.09	5.6–7.3	<2	Low	Low	Moderate	0.15	5	1
	7–60	>20	0.06–0.08	5.6–7.3	<2	Low	Low	Moderate	0.15		
Comfrey: 776	0–26	0.6–2.0	0.18–0.22	6.6–7.8	<2	Moderate	High	Low			6
	26–60	0.6–2.0	0.15–0.19	7.4–8.4	<2	Moderate	High	Low			
Chelsea: 779B	0–5	6.0–20	0.10–0.15	6.1–6.5	<2	Low	Low	Low	0.17	5	2
	5–60	6.0–20	0.06–0.08	5.1–5.5	<2	Low	Low	Low	0.17		

potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rating of soils for corrosivity to concrete is based mainly on the sulfate content, soil texture, and acidity. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Installations of steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely within one kind of soil or within one soil horizon.

Erosion factors are used in an equation that predicts the amount of erosion resulting from certain land treatment. The soil erodibility factor *K* is a measure of the susceptibility of the soil to erosion by rainfall. In table 10, soils having the highest K values are the most erodible. The soil-loss tolerance factor *T* is the maximum erosion, whether from rainfall or wind, that can occur without reducing crop production or environmental quality.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Features that relate to runoff or infiltration of water, to flooding, and to frost action of each soil are indicated in table 11. This information is helpful in planning land uses and engineering projects that are likely to be affected by the amount of runoff from watersheds, by flooding and a seasonal high water table, by bedrock or a cemented pan in the upper 5 or 6 feet of soil, by subsidence, or by frost action.

Hydrologic groups are used to estimate runoff after rainfall. Soil properties that influence the minimum rate of infiltration into the bare soil after prolonged wetting are depth to a water table, water intake rate and permeability after prolonged wetting, and depth to layers of slowly or very slowly permeable soil.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is rated in general terms that describe the frequency, duration, and period of the year when flooding is most likely. The ratings are based on evidences in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; absence of distinctive soil horizons that form in soils of the area that are not subject to flooding; local information about floodwater heights and the extent of flooding; and local knowledge that relates the unique landscape position of each soil to historic floods. Most soils in low positions on the landscape where flooding is likely to occur are classified as fluvents at the suborder level or as fluventic subgroups.

A seasonal high water table is the highest level of

TABLE 11.—*Soil and water features*

[Absence of an entry indicates the feature is not a concern. The definitions of "flooding" and "water table" in the Glossary explain terms such as "brief," "common," "apparent," and "perched." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			*In*		
Watseka: 49	B	None			1.0-3.0	Apparent	Feb-May	>60		Moderate.
Milford: 69	B/D	Occasional	Brief	Apr-Jun	0-2.0	Apparent	Mar-Jun	>60		High.
Sparta: 88B	A	None			>6.0			>60		Low.
Maumee: 89	A/D	None			0-1.0	Apparent	Dec-May	>60		High.
Ade: 98B	A	None			>6.0			>60		Low.
Palms: 100	A/D	Frequent	Long	Nov-May	0-1.0	Apparent	Nov-May	>60		High.
Sawmill: 107	B/D	Frequent	Brief	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60		High.
Selma:										
125	B/D	Occasional	Brief	Apr-Jun	0-2.0	Apparent	Mar-Jun	>60		High.
R125	B/D	Occasional	Brief	Apr-Jun	0-2.0	Apparent	Mar-Jun	38-60	Hard	High.
Alvin: 131B, 131C2, 131F	B	None			>6.0			>60		Moderate.
Elliott: 146A, 146B	C	None			1.0-3.0	Apparent	Mar-May	>60		High.
Onarga: 150A, 150B	B	None			>6.0			>60		Moderate.
Hoopeston: 172	B	None			1.0-3.0	Apparent	Mar-Jun	>60		High.
Beardstown: 188	C	None			1.0-3.0	Apparent	Mar-Jun	>60		High.
Martinton: 189	C	None			1.0-3.0	Apparent	Feb-May	>60		High.
Morley: 194B, 194C, 194E2, 194C3	C	None			3.0-6.0	Perched	Mar-May	>60		Moderate.
Gilford: 201, W201	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	>60		High.
Lena: 210	A/D	Frequent	Long	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60		High.
Varna: 223B, 223C3	C	None			3.0-6.0	Perched	Mar-May	>60		High.
Ashkum: 232	B/D	Occasional	Brief	Apr-May	0-2.0	Apparent	Apr-Jun	>60		High.
Bryce: 235	D	Occasional	Long	Mar-June	0-1.0	Apparent	Feb-Jun	>60		High.
Plattville: 240A, 240B	B	None			>6.0			40-60	Hard	Moderate
Andres: 293	B	None			1.0-3.0	Apparent	Mar-June	>60		High.
Symerton: 294A, 294B	B	None			3.0-6.0	Apparent	Mar-May	>60		Moderate.
Mokena: 295	C	None			1.0-3.0	Perched	Mar-June	>60		High.
Beecher: 298A, 298B	C	None			1.0-3.0	Apparent	Mar-Jun	>60		High.
Ritchey: 311B, 311D	B	None			>6.0			10-20	Hard	Moderate.
Channahon: 315A, 315B	D	None			>6.0			10-20	Hard	Moderate.

TABLE 11.—*Soil and water features*—Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			*In*		
Frankfort: 320A, 320B	D	None			1.0–3.0	Perched	Mar-Jun	>60		High.
Peotone: 330	B/D	Occasional	Long	Feb-Jul	0–1.0	Perched	Feb-Jul	>60		High.
Fieldon: 380	B/D	None			1.0–3.0	Apparent	Nov-Jun	>60		High.
Jasper: 440A, 440B	B	None			>6.0			>60		Moderate.
Bonfield: 493	B	None			1.0–3.0	Apparent	Apr-Jun	>60		High.
Kankakee: 494A, 494B	B	None			>6.0			>60		Moderate.
Morocco: 501	B	None			1.0–3.0	Apparent	Jan-Apr	>60		Moderate.
Rockton: 503A, 503B	B	None			>6.0			20–40	Rippable	Moderate.
Whalan: 509A, 509B	B	None			>6.0			20–40	Rippable	Moderate.
Faxon: 516	B/D	Common	Very brief	Apr-May	0–1.0	Apparent	Nov-May	20–40	Hard	High.
Markham: 531B, 531C2, 531C3	C	None			3.0–6.0	Perched	Mar-May	>60		High.
Reddick: 594	B/D	None			0–2.0	Apparent	Mar-Jun	>60		High.
Darroch: 740	C	None			1.0–3.0	Apparent	Jan-Apr	>60		High.
Oakville: 741B, 741D, 741F	A	None			>6.0			>60		Low.
Comfrey: 776	B/D	Common	Brief to long	Apr-Jul	1.0–3.0	Apparent	Apr-Jul	>60		High.
Chelsea: 779B	A	None			>6.0			>60		Low.

a saturated zone more than 6 inches thick in soils for continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed during the course of the soil survey. Indicated are the depth to the seasonal high water table; the kind of water table, whether perched, artesian, or the upper part of the ground water table; and the months of the year that the high water commonly is present. Only those saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not to construct basements and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at depths of 5 to 6 feet or less. For many soils, limited ranges in depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and other observations during the soil mapping. The kind of bedrock and its relative hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200 horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action is defined as freezing temperatures in the soil and movement of soil moisture into the freezing zone, which causes the formation of ice lenses. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that deal with the ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 12 shows the degree and kind of limitations of each soil for these uses and for use of the soil as daily cover for landfills.

If the degree of soil limitation is indicated by the rating *slight,* soils are favorable for the specified use and limitations are minor and easily overcome; if *moderate,* soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe,* soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance are required.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion and soil slippage are hazards on sloping soils.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and as a result ground water supplies in the area may be contaminated.

Percolation tests are performed to determine the absorptive capacity of the soil and its suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity.

In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved.

Sewage lagoons are shallow ponds constructed to hold sewage while bacteria decompose the solid and liquid wastes. Lagoons have a nearly level flow area surrounded by cut slopes or embankments of compacted, nearly impervious soil material. They generally are designed so that depth of the sewage is 2 to 5 feet. Impervious soil at least 4 feet thick for the lagoon floor and sides is required to minimize seepage and contamination of local ground water. Soils that are very high in organic matter and those that have stones and boulders are undesirable. Unless the soil has very slow permeability, contamination of local ground water is a hazard in areas where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce its capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste, either in excavated trenches or on the surface of the soil. The waste is spread compacted in layers and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this purpose. The best soils have a loamy or silty texture, have moderate or slow permeability, are deep to bedrock and a seasonal water table, are free of large stones and boulders, and are not subject to flooding. In areas where the seasonal water table is high, water seeps into the trenches and causes problems in excavating and filling the trenches. Also, seepage into the refuse increases the risk of pollution of ground water. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability that might allow noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 12 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the area type of sanitary landfill, refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, may be a limitation because of difficulty in operating equipment.

Daily cover for sanitary landfills should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

TABLE 12.—*Sanitary facilities*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Watseka: 49	Severe: wetness	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: too sandy.
Milford: 69	Severe: wetness, percs slowly.	Slight	Severe: wetness	Severe: wetness	Poor: wetness, too clayey.
Sparta: 88B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: too sandy.
Maumee: 89	Severe: wetness	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, seepage, too sandy.
Ade: 98B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Poor: too sandy.
Palms: 100	Severe: wetness, floods.	Severe: wetness, excess humus, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: excess humus, hard to pack.
Sawmill: 107	Severe: floods, wetness.	Severe: floods	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Selma:					
125	Severe: wetness, floods.	Severe: seepage, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness, area reclaim.
R125	Severe: wetness, depth to rock.	Severe: wetness, depth to rock.	Severe: wetness, depth to rock, floods.	Severe: wetness, floods.	Poor: wetness, area reclaim.
Alvin:					
131B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
131C2	Slight	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Good.
131F	Severe: slope	Severe: seepage, slope.	Severe: seepage	Severe: seepage, slope.	Poor: slope.
Elliott:					
146A	Severe: wetness, percs slowly.	Slight	Severe: wetness	Severe: wetness	Fair: too clayey.
146B	Severe: wetness, percs slowly.	Moderate: slope	Severe: wetness	Severe: wetness	Fair: too clayey.
Onarga: 150A, 150B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
Hoopeston: 172	Severe: wetness	Severe: seepage	Severe: seepage, wetness.	Severe: seepage	Fair: thin layer.
Beardstown: 188	Severe: wetness	Severe: seepage	Severe: seepage	Severe: wetness	Good.
Martinton: 189	Severe: percs slowly, wetness.	Slight	Severe: wetness	Moderate: wetness	Fair: too clayey.
Morley:					
194B	Severe: percs slowly	Moderate: slope	Severe: wetness	Slight	Fair: too clayey.
194C	Severe: percs slowly	Severe: slope	Severe: wetness	Slight	Fair: too clayey.
194E2	Severe: percs slowly, slope.	Severe: slope	Severe: wetness	Severe: slope	Poor: slope.
194C3	Severe: percs slowly	Severe: slope	Severe: wetness	Moderate: slope	Fair: too clayey, slope.
Gilford: 201, W201	Severe: wetness	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Lena: 210	Severe: wetness, floods.	Severe: wetness, excess humus, seepage.	Severe: seepage, floods, wetness.	Severe: seepage, floods, wetness.	Poor: excess humus, wetness.
Varna: 223B, 223C3	Severe: percs slowly	Moderate: slope	Severe: wetness	Slight	Fair: too clayey.
Ashkum: 232	Severe: percs slowly, wetness.	Slight	Severe: wetness, floods.	Severe: wetness	Poor: wetness.
Bryce: 235	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness	Poor: too clayey, wetness.
Plattville:					
240A	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Slight	Fair: too clayey, area reclaim.
240B	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Slight	Fair: too clayey, area reclaim.

TABLE 12.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Andres: 293	Severe: wetness	Slight	Severe: wetness	Severe: wetness	Fair: too clayey.
Symerton:					
294A	Severe: percs slowly	Slight	Severe: wetness	Slight	Fair: too clayey.
294B	Severe: percs slowly	Moderate: slope	Severe: wetness	Slight	Fair: too clayey.
Mokena: 295	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness	Fair: too clayey.
Beecher:					
298A	Severe: wetness, percs slowly.	Slight	Severe: wetness	Severe: wetness	Fair: too clayey.
298B	Severe: wetness, percs slowly.	Moderate: slope	Severe: wetness	Severe: wetness	Fair: too clayey.
Ritchey:					
311B	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
311D	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope	Poor: thin layer.
Channahon: 315A, 315B	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
Frankfort:					
320A	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness	Poor: too clayey.
320B	Severe: percs slowly, wetness.	Moderate: slope	Severe: too clayey, wetness.	Severe: wetness	Poor: too clayey.
Peotone: 330	Severe: percs slowly, wetness.	Slight	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Fieldon: 380	Severe: wetness	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: wetness.
Jasper: 440A, 440B	Slight	Moderate: seepage	Slight	Slight	Good.
Bonfield: 493	Severe: wetness	Severe: wetness, seepage.	Severe: seepage, wetness.	Severe: wetness, seepage.	Poor: large stones.
Kankakee: 494A, 494B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: thin layer.
Morocco: 501	Severe: wetness	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy.
Rockton: 503A, 503B	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer.
Whalan: 509A, 509B	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer.
Faxon: 516	Severe: wetness, depth to rock, floods.	Severe: wetness, depth to rock, floods.	Severe: wetness, depth to rock, floods.	Severe: wetness, floods.	Poor: wetness.
Markham: 531B, 531C2, 531C3.	Severe: percs slowly.	Moderate: slope	Moderate: too clayey.	Slight	Fair: too clayey.
Reddick: 594	Severe: wetness, percs slowly.	Slight	Severe: wetness	Severe: wetness	Poor: wetness.
Darroch: 740	Severe: wetness, percs slowly.	Moderate: seepage	Severe: seepage	Moderate: wetness	Good.
Oakville:					
741B	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy, seepage.
741D	Moderate: slope	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy, seepage.
741F	Severe: slope	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage, slope.	Poor: too sandy, seepage, slope.
Comfrey: 776	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Chelsea: 779B	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Poor: too sandy.

Water Management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the rated use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for this use have low seepage potential, which is determined by the permeability and depth over fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and is of favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

An *aquifer-fed excavated pond* is a body of water created by excavating a pit or dugout into a groundwater aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 13 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability, texture, structure, depth to claypan or other layers that influence rate of water movement, depth to the water table, slope, stability of ditchbanks, susceptibility to flooding, salinity and alkalinity, and availability of outlets for drainage.

Irrigation is affected by slope, susceptibility to flooding, water erosion and soil blowing, texture, salts and alkali, depth of root zone, rate of water intake at the surface, permeability below the surface layer, available water capacity, and depth to the water table.

Terraces and diversions are embankments, or a combination of channels and ridges, constructed across a slope to intercept runoff and allow the water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity of slope and steepness, depth to bedrock or other unfavorable material, permeability, ease of establishing vegetation, and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways channel runoff at nonerosive velocities to outlets. Features that affect the use of soils for waterways are slope, permeability, erodibility, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 14 according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreational use by the duration of flooding and the season when it occurs. Onsite assessment of height, duration, and frequency of flooding is essential in planning recreational facilities.

In table 14 the limitations of soils are rated as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 14 can be supplemented by additional information in other parts of this survey.

Camp areas require such site preparation as shaping and leveling tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet nor subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and not wet nor subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required

TABLE 13.—*Water management*

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Watseka: 49	Seepage	Piping, seepage	Deep to water	Cutbanks cave	Wetness, seepage	Not needed	Not needed.
Milford: 69	Favorable	Shrink-swell, low strength.	Favorable	Percs slowly	Wetness, slow intake.	Not needed	Not needed.
Sparta: 88B	Seepage	Piping	No water	Not needed	Seepage, droughty	Too sandy	Droughty.
Maumee: 89	Seepage	Seepage, piping	Favorable	Cutbanks cave, wetness.	Wetness, fast intake, seepage.	Not needed	Not needed.
Ade: 98B	Seepage	Seepage	No water	Not needed	Droughty, soil blowing, fast intake.	Too sandy, soil blowing, piping.	Droughty.
Palms: 100	Seepage	Compressible, hard to pack, low strength.	Favorable	Wetness, floods, cutbanks cave.	Wetness, fast intake, soil blowing.	Not needed	Not needed.
Sawmill: 107	Favorable	Shrink-swell, low strength.	Favorable	Floods	Wetness, floods	Not needed	Not needed.
Selma: 125, R125	Seepage	Favorable	Seepage	Wetness	Wetness	Not needed	Not needed.
Alvin: 131B, 131C2, 131F	Seepage	Seepage	No water	Not needed	Favorable	Favorable	Favorable.
Elliott: 146A, 146B	Favorable	Low strength	Deep to water	Favorable	Wetness, slow intake.	Percs slowly	Favorable.
Onarga: 150A, 150B	Seepage	Favorable	No water	Not needed	Favorable	Favorable	Favorable.
Hoopeston: 172	Seepage	Seepage, piping	Slow refill	Favorable	Wetness, fast intake.	Not needed	Not needed.
Beardstown: 188	Seepage	Favorable	Deep to water	Favorable	Wetness	Favorable	Favorable.
Martinton: 189	Favorable	Low strength	Deep to water	Percs slowly	Wetness, slow intake.	Not needed	Favorable.
Morley: 194B, 194C, 194E2, 194C3.	Favorable	Low strength, shrink-swell.	Deep to water	Not needed	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily.
Gilford: 201, W201	Seepage	Seepage	Favorable	Cutbanks cave	Wetness	Not needed	Favorable.
Lena: 210	Seepage	Hard to pack, low strength, excess humus.	Favorable	Cutbanks cave, floods, poor outlets.	Wetness	Not needed	Not needed.
Varna: 223B, 223C3	Favorable	Low strength	Deep to water	Not needed	Slow intake, erodes easily.	Percs slowly	Erodes easily.
Ashkum: 232	Favorable	Low strength, shrink-swell.	Favorable	Wetness, percs slowly.	Wetness	Not needed	Not needed.
Bryce: 235	Favorable	Low strength, hard to pack.	Slow refill	Percs slowly, floods.	Wetness, slow intake.	Not needed	Not needed.

Plattville: 240A, 240B	Depth to rock, seepage.	Thin layer, low strength.	No water	Not needed	Favorable	Depth to rock	Favorable.
Andres: 293	Favorable	Low strength, shrink-swell.	Deep to water	Favorable	Wetness	Favorable	Favorable.
Symerton: 294A, 294B	Favorable	Low strength, shrink-swell.	Deep to water	Not needed	Favorable	Favorable	Favorable.
Mokena: 295	Favorable	Low strength	Deep to water	Percs slowly	Wetness, slow intake.	Percs slowly	Wetness.
Beecher: 298A, 298B	Favorable	Low strength, shrink-swell.	Deep to water	Percs slowly	Wetness, slow intake.	Percs slowly	Erodes easily, percs slowly.
Ritchey: 311B, 311D	Depth to rock	Thin layer	No water	Not needed	Rooting depth	Depth to rock	Rooting depth.
Channahon: 315A, 315B	Depth to rock	Thin layer	No water	Not needed	Rooting depth	Depth to rock	Rooting depth.
Frankfort: 320A, 320B	Favorable	Low strength, shrink-swell.	Deep to water	Percs slowly	Wetness, slow intake.	Percs slowly	Erodes easily, percs slowly.
Peotone: 330	Favorable	Shrink-swell	Slow refill	Percs slowly, floods.	Wetness, slow intake.	Not needed	Not needed.
Fieldon: 380	Seepage	Piping, compressible.	Deep to water	Cutbanks cave, wetness.	Wetness	Wetness	Wetness.
Jasper: 440A, 440B	Seepage	Piping, compressible, low strength.	No water	Not needed	Favorable	Favorable	Favorable.
Bonfield: 493	Seepage	Seepage	Deep to water	Wetness	Wetness	Large stones	Large stones.
Kankakee: 494A, 494B	Seepage	Seepage	No water	Not needed	Favorable	Large stones	Large stones.
Morocco: 501	Seepage	Seepage, piping	Favorable	Cutbanks cave	Droughty, fast intake, wetness.	Not needed	Not needed.
Rockton: 503A, 503B	Depth to rock	Thin layer	No water, depth to rock.	Not needed	Rooting depth	Depth to rock	Depth to rock.
Whalan: 509A, 509B	Depth to rock	Thin layer	No water	Not needed	Favorable	Depth to rock	Rooting depth.
Faxon: 516	Depth to rock	Thin layer, low strength.	Slow refill	Wetness, depth to rock.	Wetness	Not needed	Wetness, depth to rock.
Markham: 531B, 531C2, 531C3.	Favorable	Low strength	Deep to water	Not needed	Slow intake, erodes easily.	Percs slowly	Erodes easily.
Reddick: 594	Favorable	Low strength, shrink-swell.	Slow refill	Percs slowly	Wetness, slow intake.	Not needed	Not needed.
Darroch: 740	Seepage	Compressible, low strength, piping.	Slow refill	Percs slowly, wetness.	Percs slowly, wetness.	Not needed	Not needed.
Oakville: 741B, 741D, 741F	Seepage	Piping, erodes easily.	No water	Not needed	Fast intake, seepage, soil blowing.	Complex slope, soil blowing.	Droughty, soil blowing.
Comfrey: 776	Favorable	Compressible, low strength.	Slow refill	Wetness, floods	Wetness, floods	Not needed	Wetness.
Chelsea: 779B	Seepage	Piping, erodes easily, seepage.	No water	Not needed	Droughty, erodes easily, seepage.	Complex slope, piping, too sandy.	Droughty, erodes easily, slope.

TABLE 14.—*Recreational development*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Watseka: 49	Moderate: wetness	Moderate: wetness	Moderate: wetness, too sandy.	Moderate: wetness.
Milford: 69	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Sparta: 88B	Moderate: too sandy	Moderate: too sandy	Moderate: too sandy, slope.	Moderate: too sandy.
Maumee: 89	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Ade: 98B	Moderate: too sandy	Moderate: too sandy	Moderate : too sandy	Moderate: too sandy.
Palms: 100	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.
Sawmill: 107	Severe: floods, wetness	Severe: wetness	Severe: wetness, floods	Severe: wetness.
Selma: 125, R125	Severe: wetness, floods	Severe: wetness	Severe: wetness	Severe: wetness.
Alvin:				
131B	Slight	Slight	Moderate: slope	Slight.
131C2	Slight	Slight	Severe: slope	Slight.
131F	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
Elliott:				
146A	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
146B	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly, slope.	Moderate: wetness.
Onarga:				
150A	Slight	Slight	Slight	Slight.
150B	Slight	Slight	Moderate: slope	Slight.
Hoopeston: 172	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: wetness.
Beardstown: 188	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness.
Martinton: 189	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
Morley:				
194B	Moderate: percs slowly	Slight	Moderate: percs slowly, slope.	Slight.
194C	Moderate: percs slowly	Slight	Severe: slope	Slight.
194E2	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
194C3	Moderate: percs slowly, slope.	Moderate: slope	Severe: slope	Slight.
Gilford: 201, W201	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Lena: 210	Severe: floods, wetness, excess humus.	Severe: floods, wetness	Severe: floods, wetness	Severe: floods, wetness.
Varna: 223B, 223C3	Moderate: percs slowly	Slight	Moderate: percs slowly, slope.	Slight.
Ashkum: 232	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Bryce: 235	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness.
Plattville:				
240A	Slight	Slight	Slight	Slight.
240B	Slight	Slight	Moderate: slope	Slight.
Andres: 293	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness.
Symerton:				
294A	Slight	Slight	Slight	Slight.
294B	Slight	Slight	Moderate: slope	Slight.

TABLE 14.—*Recreational development*—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Mokena: 295	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
Beecher:				
298A	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
298B	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly, slope.	Moderate: wetness.
Ritchey:				
311B	Slight	Slight	Severe: depth to rock	Slight.
311D	Moderate: slope	Moderate: slope	Severe: depth to rock, slope.	Slight.
Channahon: 315A, 315B	Slight	Slight	Severe: depth to rock	Slight.
Frankfort:				
320A	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
320B	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly, slope.	Moderate: wetness.
Peotone: 330	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, too clayey.	Severe: wetness.
Fieldon: 380	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Jasper:				
440A	Slight	Slight	Slight	Slight.
440B	Slight	Slight	Moderate: slope	Slight.
Bonfield: 493	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness.
Kankakee:				
494A	Slight	Slight	Slight	Slight.
494B	Slight	Slight	Moderate: slope	Slight.
Morocco: 501	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
Rockton:				
503A	Slight	Slight	Moderate: depth to rock.	Slight.
503B	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Whalan:				
509A	Slight	Slight	Moderate: depth to rock.	Slight.
509B	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Faxon: 516	Severe: wetness, floods	Severe: wetness	Severe: wetness, floods	Severe: wetness.
Markham: 531B, 531C2, 531C3	Moderate: percs slowly	Slight	Moderate: percs slowly, slope.	Slight.
Reddick: 594	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness.
Darroch: 740	Moderate: wetness, percs slowly.	Moderate: wetness	Moderate: wetness, percs slowly.	Moderate: wetness.
Oakville:				
741B	Moderate: too sandy, soil blowing.	Moderate: too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy, slope.
741D	Moderate: too sandy, soil blowing, slope.	Moderate: too sandy, soil blowing, slope.	Severe: too sandy, soil blowing, slope.	Severe: too sandy, slope.
741F	Severe: slope	Severe: slope	Severe: too sandy, soil blowing, slope.	Severe: too sandy, slope.
Comfrey: 776	Severe: wetness, floods	Severe: wetness	Severe: wetness, floods	Severe: wetness.
Chelsea: 779B	Moderate: too sandy	Moderate: too sandy	Severe: too sandy, slope	Moderate: too sandy.

to obtain a uniform grade, the depth of the soil over rock should be sufficient to allow necessary grading.

The design and layout of paths and trails for walking, horseback riding, and bicycling should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Formation and Classification of Soils

This section tells how the factors of soil formation have affected the development of the soils in the county and explains the system of soil classification currently used and places each soil series in the classes of that system.

Factors of Soil Formation

The principal factors of soil formation are parent material, climate, plant and animal life, relief and drainage, and time. All five of these factors come into play in the formation of every soil. The relative importance of each factor differs from place to place, and each modifies the effect of the other four. In some cases one factor may dominate the formation of a particular soil.

Parent material

Parent material of the soils in Kankakee County are of glacial origin and of the Wisconsin stage of the Pleistocene deposits. The materials are glacial till, glacial drift (stratified till and outwash), glacial outwash, and lacustrine (glacial lakebed). Alluvium (bottom land) and organic soils are primarily post-glacial in origin.

Pre-Pleistocene soils, developed from the underlying bedrock, are not found in the county. In soils that are shallow to limestone bedrock, such as Channahon and Ritchey soils, the solum is terminated by the limestone. Almost all of the bedrock shows only small amounts of weathering.

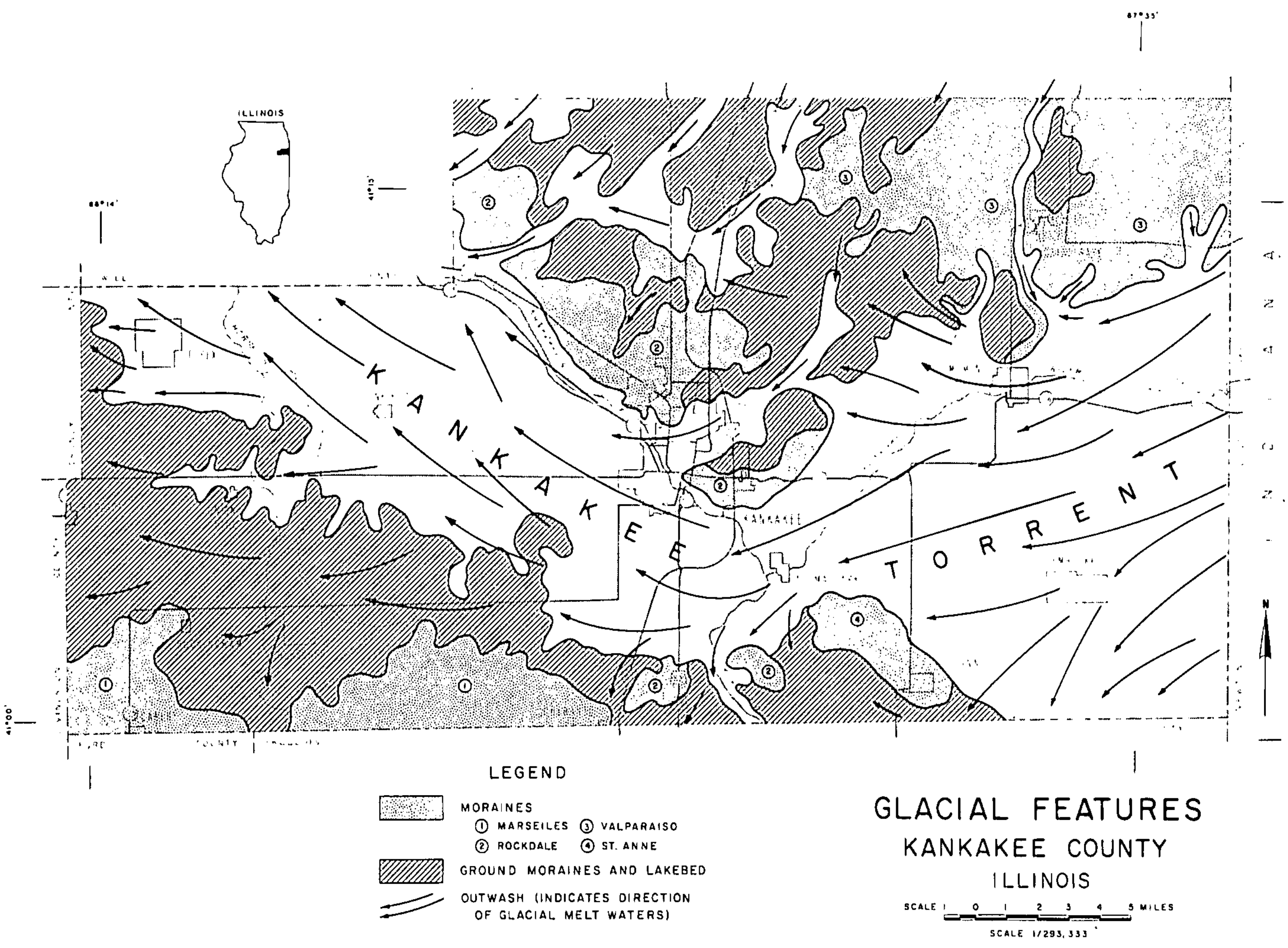

Figure 10.—Glacial features of Kankakee County, Illinois.

Loess, the silty wind-deposited glacial parent material, is not distinguishable or is confined to the surface layer of glacial till soils.

Glacial till consists of the unstratified or slightly stratified, unassorted material deposited directly by glacial ice. Glacial till is on the terminal moraine of the glacier or on the ground moraine. The two morainal systems in Kankakee County (*11*) are the Marseilles morainal system, made up of the Ransom Moraine; and the Valparaiso morainal system, made up of the West Chicago Moraine, the Wilson Center Moraine, the Rockdale Moraine, and the St. Anne Moraine (fig. 10).

The Marseilles morainal system, or Ransom Moraine, is a well defined terminal moraine and a flat ground moraine and was greatly altered and leveled by the Glacial Kankakee Torrent. The Valparaiso moraines are poorly defined and were even more eroded and altered than the Ransom Moraine by the later deposits of glacial outwash from melt water.

The glacial till is divided into three texture groupings: loam and silt loam till, represented by Symerton soils; silty clay loam and clay loam, represented by Varna and Markham soils; and silty clay, represented by some of the Frankfort soils.

Glacial drift is the partly stratified glacial till or poorly sorted glacial outwash material deposited directly by the glacier ice or by glacial melt waters in large masses. The glacial drift is mainly on the Marseilles ground moraine in the southwestern and western parts of the county. Andres and Reddick soils dominate these areas.

Glacial outwash is the stratified, assorted glacial material deposited by melt waters from the glaciers. It has four main textures: sand and loamy sand, represented by Watseka and Oakville soils; fine sandy loam, represented by Gilford and Hoopeston soils; loam and silt loam, represented by Jasper and Darroch soils; and cobbly fine sandy loam, represented by Bonfield and Kankakee soils.

In Kankakee County, most of the outwash material was deposited by the Kankakee Torrent. This gigantic glacial flood resulted from the rapid melting of three glaciers that were concentrated in southern Michigan. The melt waters then cut across northwestern Indiana and through Kankakee County. The depth of the erosive action was approximately 30 feet, as shown by the bluffs east of Kankakee and northeast of Momence. This huge torrential river stripped the bedrock of its previous drift mantle, heaped limestone rubble bars in the lee of rock hills, and, as the waters decreased in velocity, covered these bars with sand. At its highest stage, this flood of glacial melt water overflowed the Kankakee Valley and created huge glacial lakes that covered most of Iroquois County to the south and most of Grundy County, south Kendall County, and western Will County to the northwest.

Glacial lakebed material is a form of glacial sediment that was deposited in glacial lakes. It has two textures: silty clay loam, represented by Milford and Martinton soils, and silty clay, represented by Bryce soils and some Frankfort soils.

Alluvium is sand, silt, or clay that has been deposited on flood plains or bottom lands by flooding streams and rivers. Sawmill and Comfrey soils are the alluvial soils in Kankakee County.

Organic material is partly decomposed and undecomposed plant remains that have accumulated in swamps, marshes, and very seepy areas. Lena and Palms soils are the organic soils in Kankakee County.

Climate

Climate affects the formation of soils through its influence on the rate of weathering of the parent materials.

The climate of Kankakee County is conducive to the breakdown of soil mineral, the formation of clay, and the movement of these materials downward in the soil profile. However, the soils of Kankakee County are very young from a geological standpoint, and weathering has not been a major factor in their formation.

Plants and animals

Plants have had a greater effect than animals on the formation of soils in Kankakee County. The native vegetation in the county consisted of swamp and marsh grasses, prairie grasses, and hardwood forest. Most of the forested areas were on side slopes, in areas bordering the rivers and streams, and on the more pronounced sandy ridges. In general, the forested areas on the north and east sides of the river and stream valleys are wider and more defined because the streams and rivers and some marshes, lakes, and swamps acted as barriers to the almost annual prairie fires that swept over the area before settlement.

The soils that formed under grass have a darker colored surface layer that is higher in organic-matter content than soils that formed under forest.

The bottom land soils likely had a mixed prairie grass-forest cover. They are dark colored because organic matter, along with the inorganic sediment, was transported by water from the dominant dark-colored prairie soils.

Earthworms and burrowing animals help to keep soils open and porous. Bacteria and fungi hasten the decomposition of vegetation and thus release plant nutrients.

Man has noticeably affected the soil-forming processes. The kind of vegetation has been changed by clearing the forest areas, plowing the prairies, draining the marshes, and seeding these areas to crops. Recent erosion and soil blowing on cultivated cropland has removed soil from some places and deposited it in other places. The natural condition of the soils has been altered by drainage, applications of limestone and fertilizers, and by intensive cultivation. The beginning of a new cycle of soil formation has been forced in many areas by severe erosion, strip mining, land leveling, sand mining, and all forms of urban development.

Relief and drainage

In Kankakee County, relief influences the formation of soils through its effects on drainage. Slope influences the amount of runoff and, consequently, the degree of erosion and the amount of water that infiltrates through the profile. In areas where the soils formed in permeable parent material, such as fine sandy loam, the natural drainage is closely associated with slope. The well drained, moderately well drained, and excessively drained soils are in more rolling areas; the somewhat poorly drained, poorly drained, and very poorly drained soils are in nearly level or depressional areas. Kankakee County has a high percentage of nearly level soils. Soils that have slopes of more than 4 percent make up only about 6 percent of the area.

Time

The length of time necessary for a given soil to develop depends on the other factors of soil formation. Soils that formed in parent material low in calcium carbonate content develop more rapidly and become acid more readily than soils that formed in material high in calcium carbonate. Coarse textured soil material is leached of carbonates and other soluble minerals much faster than fine textured soil material. Soils develop faster under forest vegetation than under prairie vegetation because grasses are more efficient in leaching calcium and other bases from the subsoil to the surface layer. Soils generally develop faster in humid climates than in dry climates. Soils on a stable landscape generally become more strongly developed, or have greater horizon differentiation, with increased time of exposure to the weathering processes.

Geologically, the soils of Kankakee County are young. The soil materials were almost entirely deposited during the Woodfordian substage of the Wisconsin glacial stage. Radiocarbon dates have determined that this glacial period took place 22,000 to 12,500 years ago (*11*) (fig. 11).

Figure 11.—A 12,500 to 22,000 year old buried soil below stratified sands in a Watseka soil area.

Classification of Soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*7, 10, 12*).

The system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the bases for classification are the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis (*3, 8*). In table 15 the soils of the survey area are classified according to the system. Classes of the system are briefly discussed in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and that are important to plant growth or that were selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (Aqu, meaning water, plus oll, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. The name of a great group ends with the name of a suborder. A prefix added to the name suggests something about the properties of the soil. An example is Haplaquoll (*Hapl*, meaning simple horizons, plus *aquoll*, the suborder of Mollisolls that have an aquic moisture regime).

TABLE 15.—*Classification of the soils*

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Ade	Coarse-loamy, mixed, mesic Psammentic Argiudolls
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Andres	Fine-loamy, mixed, mesic Aquic Argiudolls
Ashkum	Fine, mixed, mesic Typic Haplaquolls
*Beardstown	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Beecher	Fine, illitic, mesic Udollic Ochraqualfs
Bonfield	Loamy-skeletal, mixed, mesic Aquic Hapludolls
Bryce	Fine, mixed, mesic Typic Haplaquolls
Channahon	Loamy, mixed, mesic Lithic Argiudolls
Chelsea	Mixed, mesic Alfic Udipsamments
Comfrey	Fine-loamy, mixed, mesic Cumulic Haplaquolls
Darroch	Fine-loamy, mixed, mesic Aquic Argiudolls
Elliott	Fine, illitic, mesic Aquic Argiudolls
Faxon	Fine-loamy, mixed, mesic Typic Haplaquolls
Fieldon	Coarse-loamy, mixed (calcareous), mesic Typic Haplaquolls
Frankfort	Fine, illitic, mesic Udollic Ochraqualfs
Gilford	Coarse-loamy, mixed, mesic Typic Haplaquolls
Hoopeston	Coarse-loamy, mixed, mesic Aquic Hapludolls
Jasper	Fine-loamy, mixed, mesic Typic Argiudolls
Kankakee	Loamy-skeletal, mixed, mesic Typic Hapludolls
Lena	Euic, mesic Typic Medisaprists
Markham	Fine, illitic, mesic Mollic Hapludalfs
Martinton	Fine, illitic, mesic Aquic Argiudolls
Maumee	Sandy, mixed, mesic Typic Haplaquolls
Milford	Fine, mixed, mesic Typic Haplaquolls
Mokena	Fine-loamy, mixed, mesic Aquic Argiudolls
Morley	Fine, illitic, mesic Typic Hapludalfs
Morocco	Mixed, mesic Aquic Udipsamments
Oakville	Mixed, mesic Typic Udipsamments
*Onarga	Coarse-loamy, mixed, mesic Typic Argiudolls
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Peotone	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Plattville	Fine-loamy, mixed, mesic Typic Argiudolls
Reddick	Fine-loamy, mixed, mesic Typic Haplaquolls
Ritchey	Loamy, mixed, mesic Lithic Hapludalfs
Rockton	Fine-loamy, mixed, mesic Typic Argiudolls
Sawmill	Fine-silty, mixed, mesic Cumulic Haplaquolls
Selma	Fine-loamy, mixed, mesic Typic Haplaquolls
Sparta	Sandy, mixed, mesic Entic Hapludolls
Symerton	Fine-loamy, mixed, mesic Typic Argiudolls
Varna	Fine, illitic, mesic Typic Argiudolls
Watseka	Sandy, mixed, mesic Aquic Hapludolls
Whalan	Fine-loamy, mixed, mesic Typic Hapludalfs

SUBGROUP. Each great group is divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. The adjective *Typic* is used for the subgroup that is thought to typify the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-loamy, mixed, mesic, Typic Haplaquolls.

SERIES. The series consists of a group of soils that are formed from a particular kind of parent material and have horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

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Glossary

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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 oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Compressible. Excessive decrease in volume of soft soil under load.

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; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, 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 classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mehophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearingaway of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erostion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as non, rare, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; occasional that it occurs on an average of once or less in 2 years; and frequent that it occurs on an average of more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows.

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

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 a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Kame (geology). An irregular, short ridge or hill or stratified glacial drift.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Low strength. Inadequate strength for supporting loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded 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 of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.20 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inch), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 0.7 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.0 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Root zone. The part of the soil that can be penetrated by plant roots.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage road, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and 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 C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizon. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plants and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. 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 either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has 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, silt loam, 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."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs.

Map symbol	Mapping unit	Page	Management group Symbol	Management group Page	Tree planting group Number
49	Watseka loamy fine sand	39	IIIw-1	44	2
69	Milford silty clay loam	27	IIw-2	43	4
88B	Sparta loamy fine sand, 1 to 5 percent slopes	37	IVs-1	45	6
89	Maumee loamy fine sand	26	IIIw-1	44	4
98B	Ade loamy fine sand, 1 to 5 percent slopes	9	IIIs-1	45	6
100	Palms muck	31	IIIw-2	44	7
107	Sawmill silty clay loam	35	IIw-1	42	5
125	Selma loam	36	IIw-1	42	4
R125	Selma loam, bedrock substratum	36	IIw-1	42	4
131B	Alvin fine sandy loam, 1 to 4 percent slopes	11	IIs-1	43	1
131C2	Alvin fine sandy loam, 4 to 10 percent slopes, eroded	11	IIIs-1	45	1
131F	Alvin fine sandy loam, 12 to 30 percent slopes	11	VIIs-1	46	1
146A	Elliott silt loam, 0 to 2 percent slopes	18	IIw-3	43	3
146B	Elliott silt loam, 2 to 4 percent slopes	18	IIe-2	42	3
150A	Onarga fine sandy loam, 0 to 2 percent slopes	31	IIs-1	43	1
150B	Onarga fine sandy loam, 2 to 4 percent slopes	31	IIs-1	43	1
172	Hoopeston fine sandy loam	22	IIs-2	43	2
188	Beardstown silt loam	13	IIs-2	43	2
189	Martinton silt loam	26	IIw-3	43	3
194B	Morley silt loam, 2 to 4 percent slopes	28	IIe-3	42	3
194C	Morley silt loam, 4 to 10 percent slopes	29	IIIe-1	44	3
194E2	Morley silt loam, 12 to 25 percent slopes, eroded	29	VIe-1	45	3
194C3	Morley soils, 5 to 12 percent slopes, severely eroded	29	IVe-1	45	3
201	Gilford fine sandy loam	21	IIIw-1	44	4
W201	Gilford fine sandy loam, wet	21	VIIw-1	46	5
210	Lena muck	24	IIIw-2	44	7
223B	Varna silt loam, 1 to 4 percent slopes	38	IIe-3	42	3
223C3	Varna soils, 4 to 7 percent slopes, severely eroded	38	IVe-1	45	3
232	Ashkum silty clay loam	12	IIw-2	43	4
235	Bryce silty clay	15	IIw-4	43	4
240A	Plattville silt loam, 0 to 2 percent slopes	32	I-1	41	1
240B	Plattville silt loam, 2 to 4 percent slopes	33	IIe-1	41	1
293	Andres silt loam	12	I-1	41	2
294A	Symerton silt loam, 0 to 2 percent slopes	37	I-1	41	1
294B	Symerton silt loam, 2 to 4 percent slopes	37	IIe-1	41	1
295	Mokena loam	28	IIw-3	43	3
298A	Beecher silt loam, 0 to 2 percent slopes	14	IIw-4	43	3
298B	Beecher silt loam, 2 to 4 percent slopes	14	IIe-2	42	3
311B	Ritchey silt loam, 2 to 6 percent slopes	34	IIIs-3	45	2
311D	Ritchey silt loam, 10 to 15 percent slopes	34	VIe-1	45	2
315A	Channahon silt loam, 0 to 2 percent slopes	16	IIIs-3	45	2
315B	Channahon silt loam, 2 to 4 percent slopes	16	IIIs-3	45	2
320A	Frankfort silt loam, 0 to 2 percent slopes	20	IIw-4	43	3
320B	Frankfort silt loam, 2 to 6 percent slopes	20	IIIe-1	44	3
330	Peotone silty clay loam	32	IIw-2	43	5
380	Fieldon loam	19	IIIw-3	45	4
440A	Jasper silt loam, 0 to 2 percent slopes	23	I-1	41	1
440B	Jasper silt loam, 2 to 4 percent slopes	23	IIe-1	41	1
493	Bonfield loam	14	IIs-2	43	2
494A	Kankakee fine sandy loam, 0 to 2 percent slopes	24	IIs-1	43	1
494B	Kankakee fine sandy loam, 2 to 4 percent slopes	24	IIs-1	43	1
501	Morocco fine sand	29	IVs-1	45	2
503A	Rockton loam, 0 to 2 percent slopes	35	IIs-3	44	2
503B	Rockton loam, 2 to 4 percent slopes	35	IIs-3	44	2

Map symbol	Mapping unit	Page	Management group Symbol	Management group Page	Tree planting group Number
509A	Whalan loam, 0 to 2 percent slopes	39	IIs-3	44	2
509B	Whalan loam, 2 to 4 percent slopes	39	IIe-1	41	2
516	Faxon clay loam	19	IIIw-3	45	4
531B	Markham silt loam, 1 to 4 percent slopes	25	IIe-3	42	3
531C2	Markham silt loam, 4 to 7 percent slopes, eroded	25	IIIe-1	44	3
531C3	Markham soils, 4 to 7 percent slopes, severely eroded	25	IVe-1	45	3
594	Reddick clay loam	33	IIw-1	42	4
740	Darroch silt loam	18	IIw-3	43	2
741B	Oakville fine sand, 1 to 6 percent slopes	30	IVs-1	45	6
741D	Oakville fine sand, 7 to 18 percent slopes	30	VIIs-1	46	6
741F	Oakville fine sand, 18 to 40 percent slopes	30	VIIs-1	46	6
776	Comfrey soils	17	IIw-1	42	4
779B	Chelsea fine sand, 1 to 6 percent slopes	16	IVs-1	45	6

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