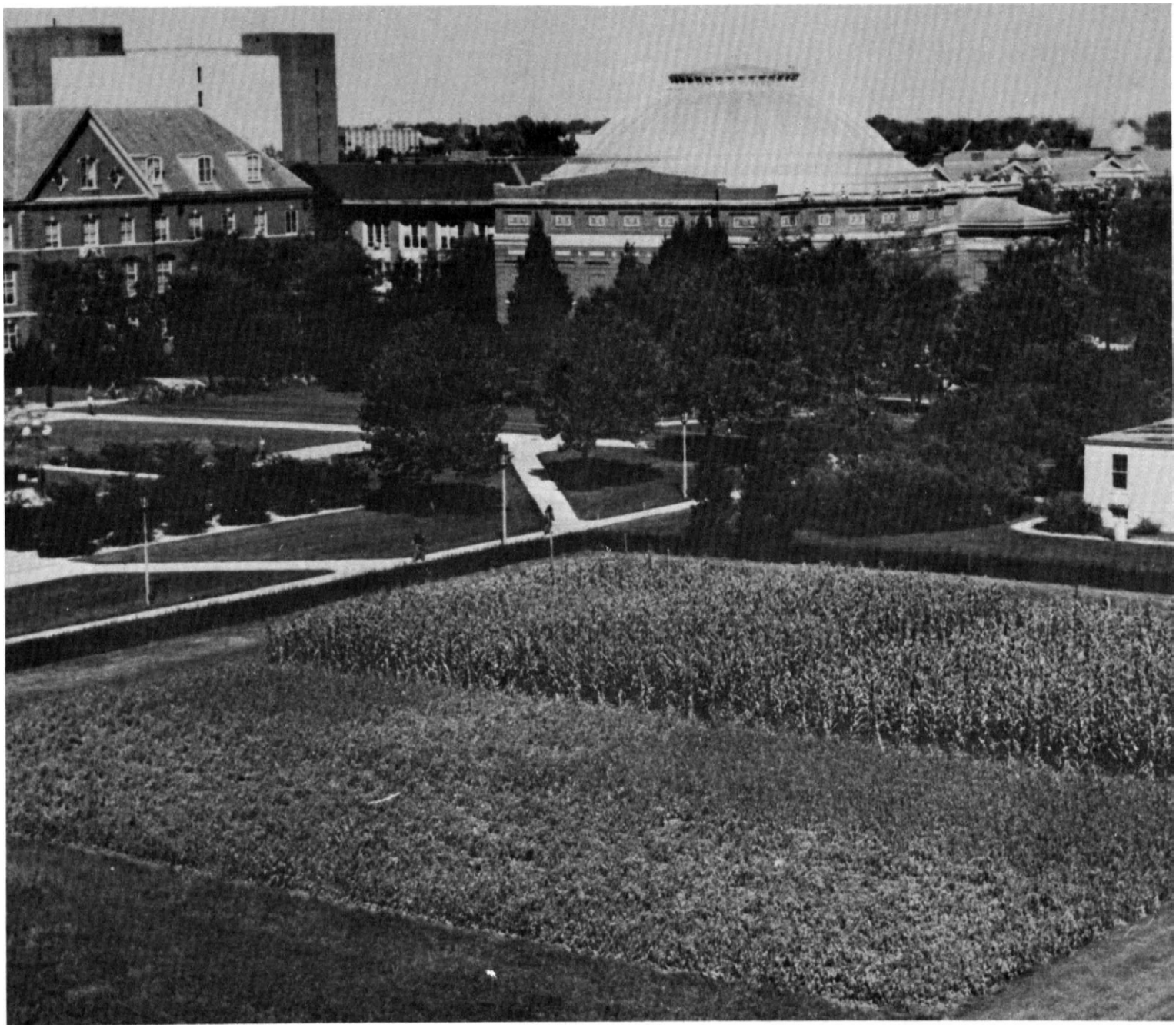
United States Department of Agriculture
Soil Conservation Service
in cooperation with
Illinois Agricultural Experiment Station

Soil Survey of
Champaign County, Illinois



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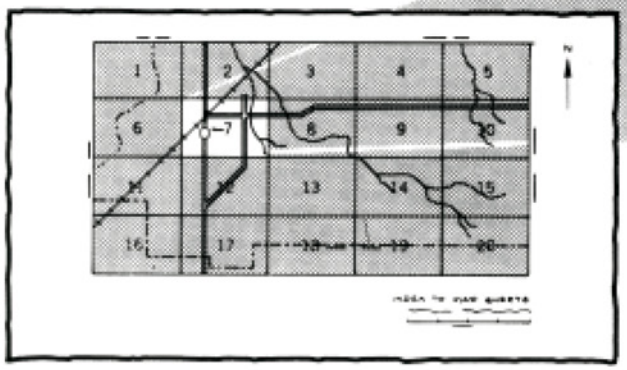

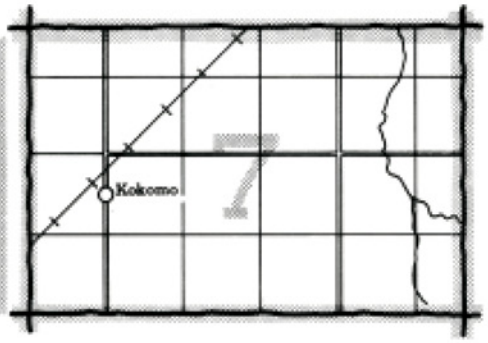

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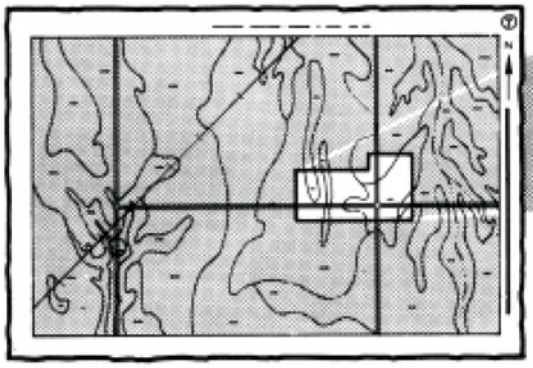

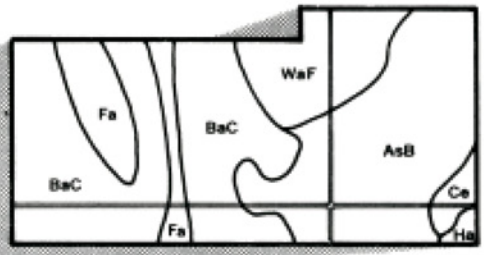

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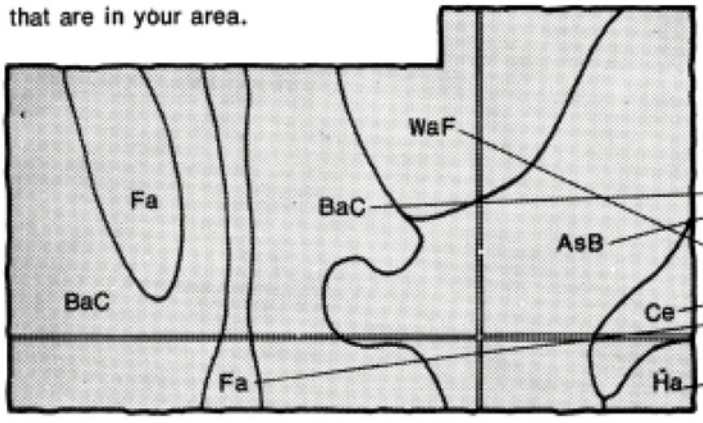

Symbols

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BaC
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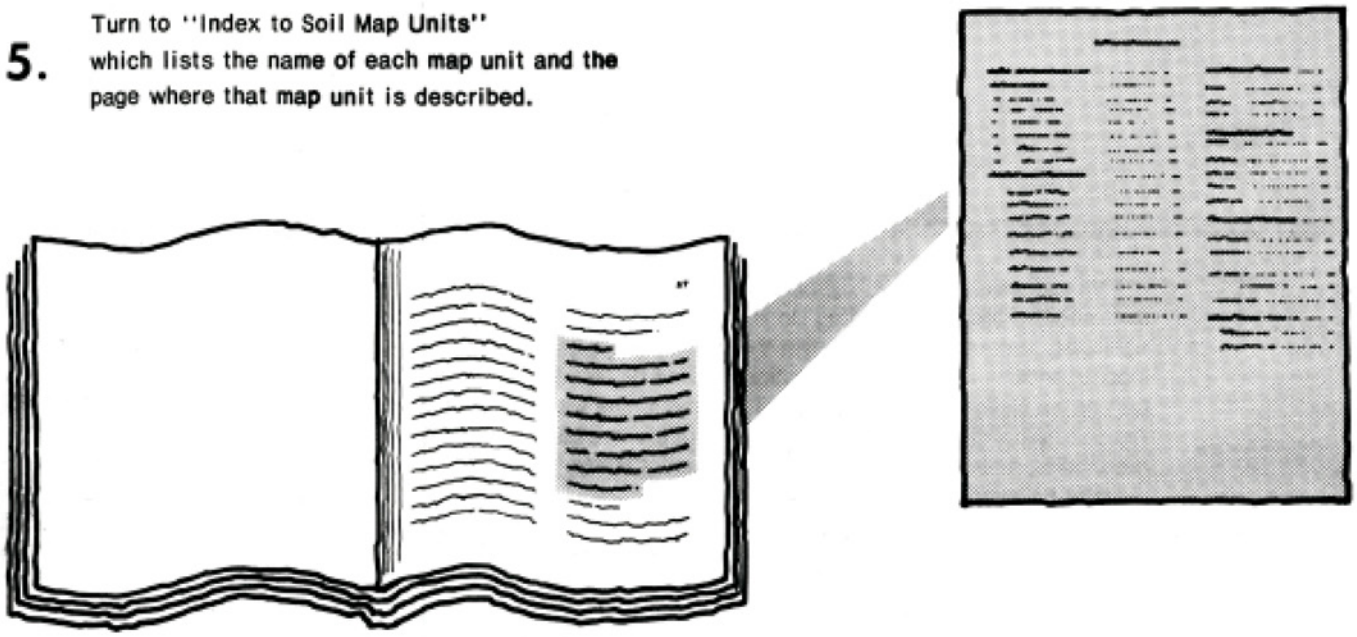
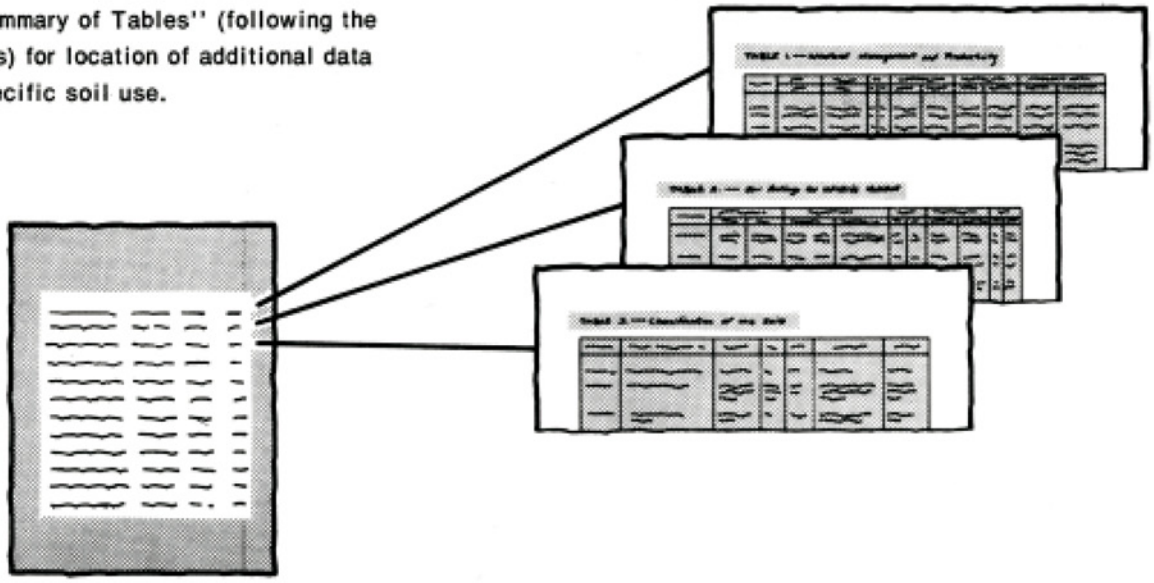
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. 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, regardless of race, color, national origin, sex, religion, marital status, or age.

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 Champaign County Soil and Water Conservation District. The cost was shared by the Champaign County Board. Major fieldwork was performed in the period 1975 to 1979. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

This soil survey is Illinois Agricultural Experiment Station Soil Report 114.

Cover: The Morrow Plots in an area of Flanagan-Urban land complex, 0 to 3 percent slopes, at the University of Illinois. Established in 1876, these are the oldest continuous experiment fields in the United States. Photo courtesy of the Agricultural Communications Department, University of Illinois.

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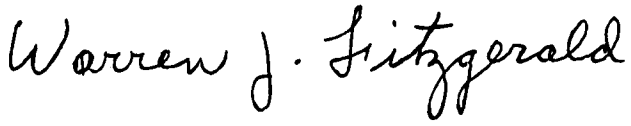
foreword

This soil survey contains information that can be used in land-planning programs in Champaign County, Illinois. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



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State Conservationist
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soil survey of
Champaign County, Illinois

By H. R. Mount, Soil Conservation Service

Fieldwork by H. R. Mount, C. C. Cochran, and C. E. Wacker,
Soil Conservation Service, and S. Engel, Champaign County

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Illinois Agricultural Experiment Station

CHAMPAIGN COUNTY is in the east-central part of Illinois (fig. 1). It has an area of 640,000 acres, or about 1,000 square miles. It is bordered on the north by Ford County, on the east by Vermilion County, on the south by Douglas County, and on the west by Piatt and McLean Counties. In 1974, the population of the county was 165,621. Urbana, the county seat, had a population of 34,905 and Champaign, the largest city, one of 60,947.

This soil survey updates the survey of Champaign County published in 1918 (*5*) and the one of the Champaign-Urbana area published in 1974 (*1*). It provides larger maps, which show the soils in greater detail than the survey published in 1918. Also, it provides more recent information about the soils than that in the survey published in 1974.

general nature of the county

The following paragraphs provide general information about Champaign County. They describe the climate; the history and development; the transportation facilities; the natural resources; and the relief, physiography, and drainage.

climate

Champaign County is cold in winter but hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. Normal annual precipitation is adequate for all crops that are suited to the temperature and length of growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Urbana, Illinois, for the period 1951 to 1973. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 29 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Urbana on February 2, 1951, is -18 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on June 20, 1953, is 103 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 23 inches, or about 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 3.56 inches at Urbana on October 6, 1955. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is about 23 inches. The greatest snow depth at any one time during the period of

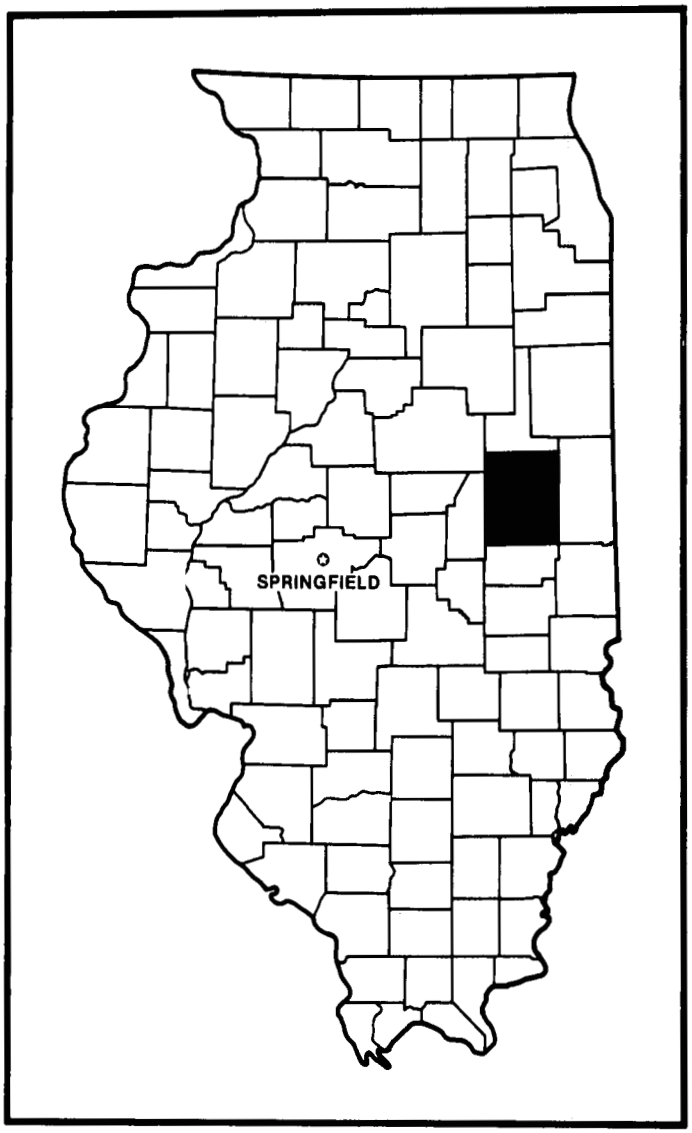

Figure 1.—Location of Champaign County in Illinois.

record was 15 inches. On the average, 13 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 70 in summer and 50 in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration and cause damage in a variable pattern.

Climatic data for this section were especially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

history and development

The area now known as Champaign County was annexed to the Union as a part of the Northwest Territory in 1787. It was at one time the west part of Vermilion County. On February 20, 1833, it was established as a separate county. Urbana was named as the county seat. Growth was slow until the arrival of the railroads in 1853. Since that time the county has made steady social and economic progress.

Originally, Champaign County had much wet, marshy land. Cattle raising was the primary early industry. In the late 1800's, many drainage districts were formed to drain the land by dredging ditches. This drainage system allowed for the cultivation of the level, wet areas. As a result, the major land use changed from cattle raising to grain farming.

In 1867, a land grant college, later to become the University of Illinois, was established in the Champaign-Urbana area. The university has been a major influence in the economic and cultural development of the county. About 1,900 acres of agricultural experiment fields, including the Morrow Plots, the oldest continuous experimental plots in the United States (fig. 2), are adjacent to the campus. Other educational institutions include Parkland Junior College, in Champaign, and Chanute Technical Training Center, a training facility for the United States Air Force, in Rantoul.

Diverse economic, cultural, and social institutions have been established in the county. A variety of libraries, newspapers, and radio and television stations serve local communities. The principal manufactured products are road machinery, alloy castings, sporting goods, air-conditioning equipment, bleachers, motorcycle accessories, and a variety of food and plastic products. Urban development is likely to continue in the future (fig. 3). Agriculture and agribusiness are important parts of the local economy. More than 80 percent of the acreage in the county is used for cultivated crops, primarily corn and soybeans.

transportation facilities

The transportation facilities available in Champaign County include interstate highways, railroads, and airports. Interstate Highways 74, 57, and 72 and Federal Highways 136, 150, and 45 cross the county. Several state and county roads also provide important transportation links. Most of the secondary township and county roads are blacktopped. Railroads provide both passenger and freight service. Several rail lines pass through the Champaign-Urbana area and through Rantoul, and at least one rail line passes through most

Figure 2.—Experimental plots at the University of Illinois.

of the smaller towns. A major airport south of Savoy provides commercial air service, and several smaller airports are throughout the county.

natural resources

Soil is the chief natural resource in Champaign County. An estimated 2,000 farms make up more than 80 percent of the total acreage. Corn and soybeans are the major crops. Secondary farm products include wheat, oats, hay, cattle, hogs, and eggs. The county has some of the most productive farmland in the state. Most of the soils are nearly level or gently sloping and formed in medium textured material under tall prairie grasses. Combined with a favorable climate, these factors result in highly productive farmland.

About 7,000 acres in the county is woodland. Much of this acreage is unimproved land along the major drainageways. Wildlife generally is scarce because most of the suitable habitat has been destroyed. There are no natural lakes in the county. More than 450 acres of manmade lakes and about 120 miles of streams, however, provide fishing opportunities. Sunfish, bass, crappie, catfish, northern pike, and other fish inhabit these waters.

Subsurface natural resources in the county include water, sand and gravel, and coal. Most of the water supply is pumped from an aquifer system in the Teays Valley, a major bedrock valley in the northwestern part of the county. About 26,000 acres is underlain by sand and gravel. Less than 2 percent of this acreage has been mined (fig. 4). An estimated 180,000 tons of coal is below the surface of the county. The coal is about 300 feet deep. It has not been mined.

relief, physiography, and drainage

All of Champaign County was covered by the Kansan, Illinoian, and Wisconsin glaciers during the Pleistocene glacial epoch. The Wisconsin was the most recent stage

Figure 3 —Urban development on Drummer and Elburn soils.

of glaciation. This glacier deposited an average of more than 200 feet of glacial drift, forming the present topography. In most areas this glacial drift was covered by as much as 5 feet of windblown silt, or loess.

The county is dissected by several gently undulating moraines separated by wide, nearly level till or outwash plains. The highest feature in the county is the Champaign Moraine, which reaches an altitude of 860 feet north of Rising. The lowest elevation, in the area where the Salt Fork leaves the county, is about 630 feet.

Six major watersheds drain the county. These are Salt Fork, Sangamon, Kaskaskia, and Embarras Rivers, the Middle Fork of the Vermilion River, and the Little Vermilion River. The watercourses drain primarily to the southeast and southwest. About 25,000 acres adjacent to drainageways is subject to temporary flooding. A drainage system is needed in the flatter areas. An estimated 165 miles of surface ditches has been established, and more than 4,300 miles of subsurface tile has been installed.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles.

Figure 4.—Mined area of sand and gravel along the Sangamon River.

A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Because of differences in the extent of the major soils, the names of the associations on the general soil map of this county do not completely agree with those on the general soil map of adjacent Douglas County. Because the soils are similar, however, these differences do not significantly affect the use of the map for general planning of land uses.

The associations in this county have been grouped for broad interpretive purposes. The following pages describe the 4 groups and 11 associations in the county.

soil descriptions

Nearly level to sloping soils formed in loess and in the underlying glacial till or outwash on till plains

These soils are on till plains characterized by swells and hills and by low areas. Also evident are short, steep slopes and small areas of bottom land.

1. Drummer-Flanagan association

Nearly level, poorly drained and somewhat poorly drained, silty soils on till plains

This association is characterized by swells and by low areas. The soils on the swells have nearly level slopes that are 100 to more than 1,000 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 36 percent of the county. It is about 50 percent Drummer soils, 40 percent Flanagan soils, and 10 percent minor soils (fig. 5).

The poorly drained Drummer soils are in drainageways and shallow depressions. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is grayish brown and yellowish brown silty clay loam; and the lower part is yellowish brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

The somewhat poorly drained Flanagan soils are on slight rises above the Drummer soils. Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown silt loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled silty clay loam; the next part is yellowish brown, mottled silty clay loam; and the lower part is mottled yellowish brown, light olive brown, brown, and light brownish gray silt loam. The underlying material to a depth of 60 inches is yellowish brown, mottled, calcareous loam.

Minor in this association are Catlin, Dana, Pella, and Raub soils. The moderately well drained Catlin and Dana soils are in the areas above the Flanagan soils. The poorly drained Pella soils occur as areas closely intermingled with areas of the Drummer soils. The somewhat poorly drained Raub soils occur as areas closely intermingled with areas of the Flanagan soils.

Most of this association is used for cultivated crops. The soils are well suited to all of the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are high in both of the major soils. Available water capacity also is high. The main management needs are measures that maintain the drainage system, tilth, and fertility.

2. Drummer-Raub association

Nearly level, poorly drained and somewhat poorly drained, silty soils on till plains

This association is characterized by swells and by low areas. The soils on the swells have nearly level slopes

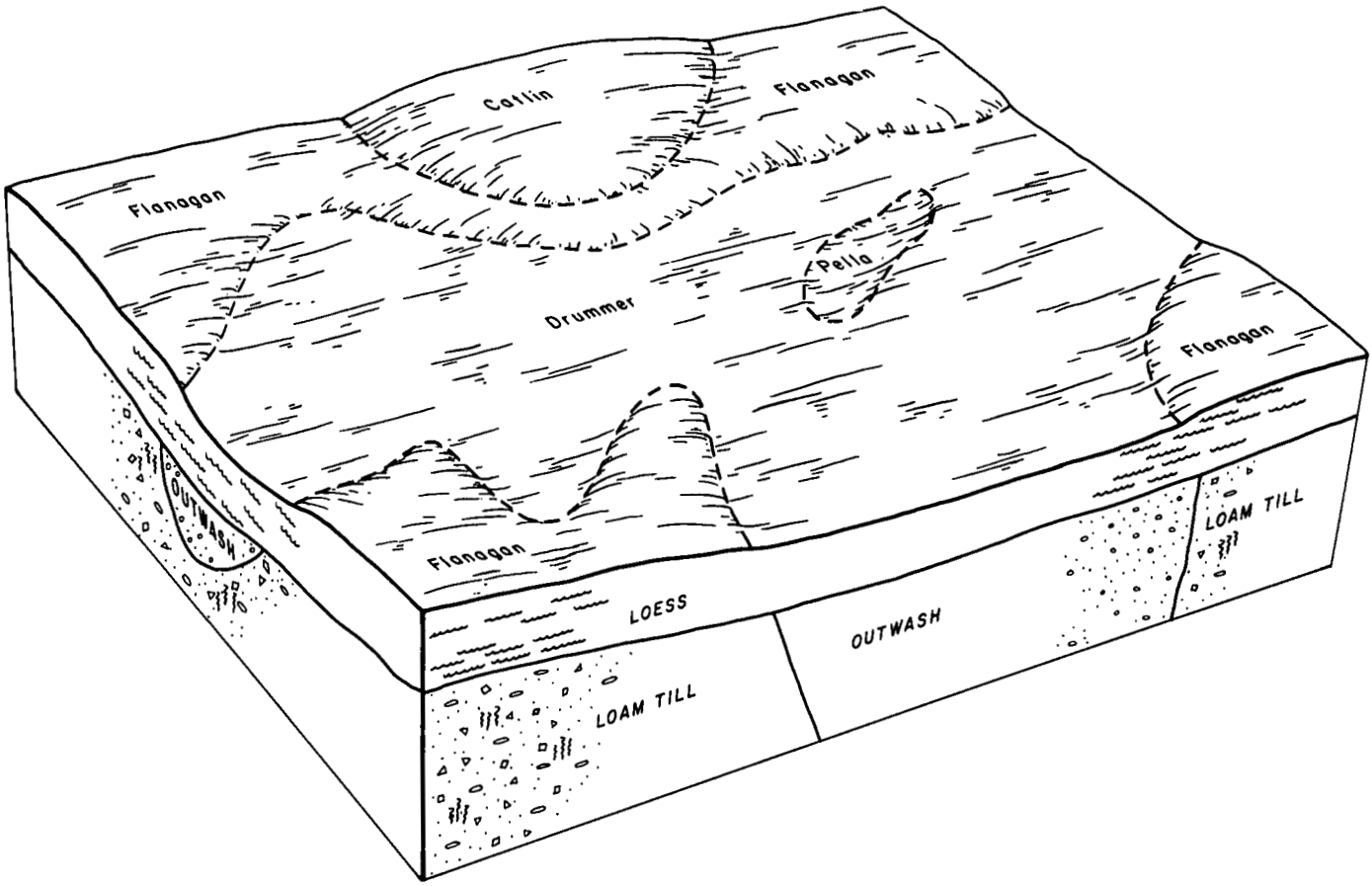

Figure 5.—Typical pattern of soils and parent material in the Drummer-Flanagan association.

that are 100 to 800 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 12 percent of the county. It is about 45 percent Drummer soils, 25 percent Raub soils, and 30 percent minor soils.

The poorly drained Drummer soils are in drainageways. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is grayish brown and yellowish brown silty clay loam; and the lower part is yellowish brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

The somewhat poorly drained Raub soils are on slight rises above the Drummer soils. Typically, the surface soil is black and very dark grayish brown silt loam about 18 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and mottled. The upper part is silty clay loam, and the lower part is clay loam. The underlying material to a depth of 60 inches is mottled yellowish brown and gray, calcareous loam.

Minor is this association are Brenton, Dana, Jasper, and Parr soils. The somewhat poorly drained Brenton soils occur as areas closely intermingled with areas of the Raub soils. The moderately well drained Dana and well drained Jasper and Parr soils are in areas above the Raub soils. They are subject to water erosion.

Most of this association is used for cultivated crops, but many areas are used for hay and pasture. The soils are well suited to all of the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. The content of organic matter is high in the Drummer soils and moderate in the Raub soils. Fertility is high in both of the major soils. Available water capacity also is high. The main management needs are measures that maintain the drainage system, tilth, and fertility.

3. Dana-Parr-Drummer association

Nearly level to sloping, moderately well drained, well drained, and poorly drained, silty soils on till plains

This association is on ground moraines made up of swells and swales. Differences in elevation between the

swells and the swales range from 10 to 100 feet. The soils on the swells are gently sloping and sloping. The low areas are nearly level and commonly are closely intermingled with the more sloping areas. A few isolated spots in the southeastern part of the county are strongly sloping.

This association makes up about 7 percent of the county. It is about 30 percent Dana soils, 20 percent Parr soils, 20 percent Drummer soils, and 30 percent minor soils (fig. 6).

The gently sloping, moderately well drained Dana soils either are on slopes below the Parr soils or occur as areas closely intermingled with areas of those soils. Typically, the surface soil is very dark grayish brown silt loam about 12 inches thick. The subsoil is about 38 inches thick. It is mottled. The upper part is brown and yellowish brown silty clay loam; the next part is yellowish brown clay loam; and the lower part is light olive brown loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam.

The gently sloping and sloping, well drained Parr soils are on side slopes, ridgetops, and toe slopes. Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 21 inches thick. The upper part is brown and light olive brown clay loam, and the lower part is light olive brown loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam.

The nearly level, poorly drained Drummer soils are in drainageways below the Parr and Dana soils. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is grayish brown and yellowish brown silty clay loam; and the lower part is yellowish brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

Minor in this association are Brenton, Catlin, Flanagan, Peotone, and Raub soils. The somewhat poorly drained Brenton, Flanagan, and Raub soils are in areas below the Dana soils. The moderately well drained Catlin soils occur as areas closely intermingled with areas of the Dana soils. The very poorly drained Peotone soils are in enclosed depressions.

Most of this association is used for cultivated crops, but a few areas are used for hay and pasture. The soils

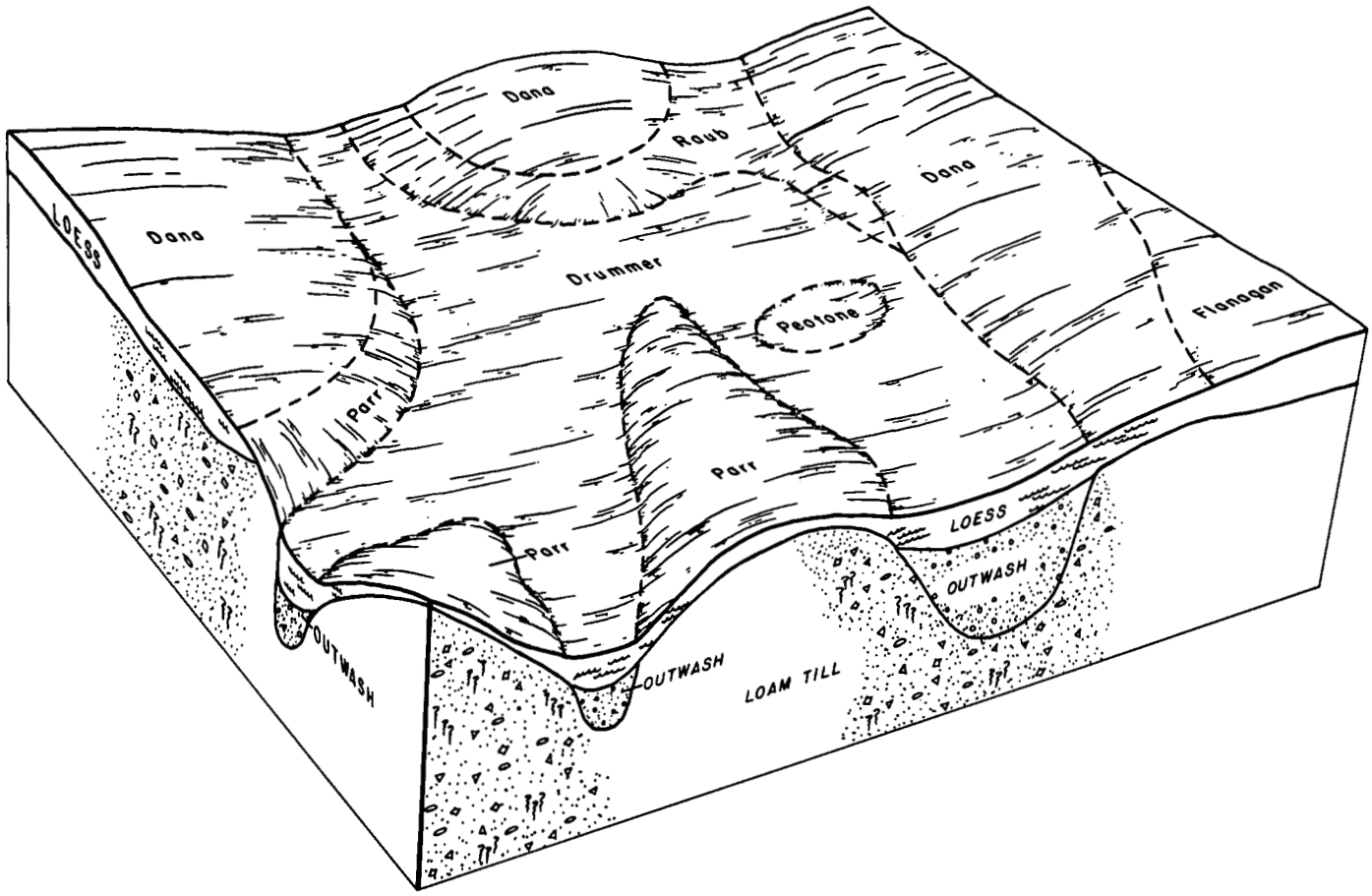

Figure 6.—Typical pattern of soils and parent material in the Dana-Parr-Drummer association.

generally are well suited to the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are moderate in the Parr and Dana soils and high in the Drummer soils. Available water capacity is moderate in the Parr soils and high in the Dana and Drummer soils. The main management needs are measures that control erosion and soil blowing, maintain the drainage system in the Drummer soils, and maintain tilth and fertility.

4. Drummer-Xenia association

Nearly level and gently sloping, poorly drained and moderately well drained, silty soils on till plains

This association is characterized by swells and low areas. Also evident in some areas are short, steep slopes and bottom land less than one-quarter of a mile wide. The soils on the swells have gentle slopes that are 100 to 500 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 6 percent of the county. It is about 30 percent Drummer soils, 15 percent Xenia soils, and 55 percent minor soils.

The nearly level, poorly drained Drummer soils are in drainageways below the Xenia soils. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is grayish brown and yellowish brown silty clay loam; and the lower part is yellowish brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

The gently sloping, moderately well drained Xenia soils are on rises above the Drummer soils. Typically, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is about 47 inches thick. The upper part is brown silt loam; the next part is brown and dark yellowish brown, mottled silty clay loam; and the lower part is mottled brown and light olive brown clay loam and loam. The underlying material to a depth of 72 inches is light olive brown, calcareous loam.

Minor in this association are Birkbeck, Colo, Miami, Russell, Sabina, and Sunbury soils. The moderately well drained Birkbeck soils occur as areas closely intermingled with areas of the Xenia soils. The poorly drained Colo soils are in small areas on bottom land. The well drained Miami and Russell soils are in areas above the Xenia soils. The somewhat poorly drained, nearly level Sabina and Sunbury soils are on slopes below the Xenia soils.

Most of this association is used for cultivated crops, but some of the acreage is used for hay, pasture, or trees. The soils are well suited to the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Available water capacity is high in both of the major soils. Fertility also is high. The content of organic matter is high in the Drummer soils but is moderately low in the Xenia soils. The main management needs are measures that control erosion and soil blowing, maintain the drainage system in the Drummer soils, and maintain tilth and fertility.

Nearly level and gently sloping soils formed in loess and glacial outwash on outwash plains

These soils are on the glacial outwash plains that are interspersed throughout till plains and moraines. The landscape is characterized by swells and by low areas. Also evident are short, steep slopes and small areas of bottom land.

5. Drummer-Elburn-Brenton association

Nearly level, poorly drained and somewhat poorly drained, silty soils on outwash plains

This association is on outwash plains characterized by swells and by low areas. The soils on the swells have nearly level slopes that are 100 to more than 1,000 feet long. Those in the low areas are nearly level to depressional. In a few areas slopes are shorter and steeper. A few small areas are on bottom land.

This association makes up about 23 percent of the county. It is about 45 percent Drummer soils, 13 percent Elburn soils, 12 percent Brenton soils, and 30 percent minor soils.

The poorly drained Drummer soils are in drainageways below the Brenton and Elburn soils. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is yellowish brown and grayish brown silty clay loam; and the lower part is yellowish brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

The somewhat poorly drained Elburn soils are on rises above the Drummer soils. They commonly occur as areas closely intermingled with areas of the Brenton soils. Typically, the surface soil is very dark gray silt loam about 16 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, mottled silty clay loam; the next part is mottled grayish brown and yellowish brown silty clay loam; and the lower part is light brownish gray, mottled silt loam stratified with loam and sandy loam. The underlying material to a depth of 60 inches is mottled grayish brown and yellowish brown sandy loam stratified with coarse sand.

The somewhat poorly drained Brenton soils are on slight rises above the Drummer soils. Typically, the surface soil is black and very dark gray silt loam about 16 inches thick. The subsoil is about 37 inches thick. It is brown and dark yellowish brown and is mottled. The upper part is silty clay loam, and the lower part is clay

loam. The underlying material to a depth of 72 inches is mottled brownish yellow and light gray silt loam and sandy loam stratified with thin layers of loamy sand.

Minor in this association are Colo, Harpster, Jasper, La Hogue, Millbrook, Peotone, Plano, Proctor, Thorp, and Wea soils. The poorly drained Colo soils are in small areas on bottom land. The poorly drained Harpster and Thorp soils occur as areas closely intermingled with areas of the Drummer soils. Also, Harpster soils have a calcareous surface layer. The well drained Jasper soils are in areas above the Brenton and Elburn soils. The somewhat poorly drained La Hogue and Millbrook soils occur as areas closely intermingled with areas of the Brenton soils. The very poorly drained Peotone soils are in enclosed depressions. The moderately well drained Plano and Proctor soils generally are in areas above the Elburn soils. The well drained Wea soils occur as areas closely intermingled with areas of the Brenton soils. They are underlain by sand and gravel.

Most of this association is used for cultivated crops, but a few areas are used for hay and pasture. The soils are well suited to all of the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are high in all of the major soils. Available water capacity also is high. The main management needs are measures that control soil blowing and maintain the drainage system, tilth, and fertility.

6. Drummer-Kendall-St. Charles association

Nearly level and gently sloping, poorly drained to moderately well drained, silty soils on outwash plains

This association is on outwash plains characterized by swells and knolls and by low areas. Also evident are short, steep slopes and small areas of bottom land. The swells have slopes that are 100 to 500 feet long.

This association makes up about 1 percent of the county. It is about 30 percent Drummer soils, 15 percent Kendall soils, 15 percent St. Charles soils, and 40 percent minor soils (fig. 7).

The nearly level, poorly drained Drummer soils are in drainageways below the Kendall and St. Charles soils. Typically, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray silty clay loam; the next part is grayish brown and yellowish brown silty clay loam; and the lower part is brown loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam.

The nearly level, somewhat poorly drained Kendall soils are on slight rises above the Drummer soils and below the St. Charles soils. Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsurface layer is grayish brown silt loam about 7 inches thick. The subsoil is about 32 inches thick. The

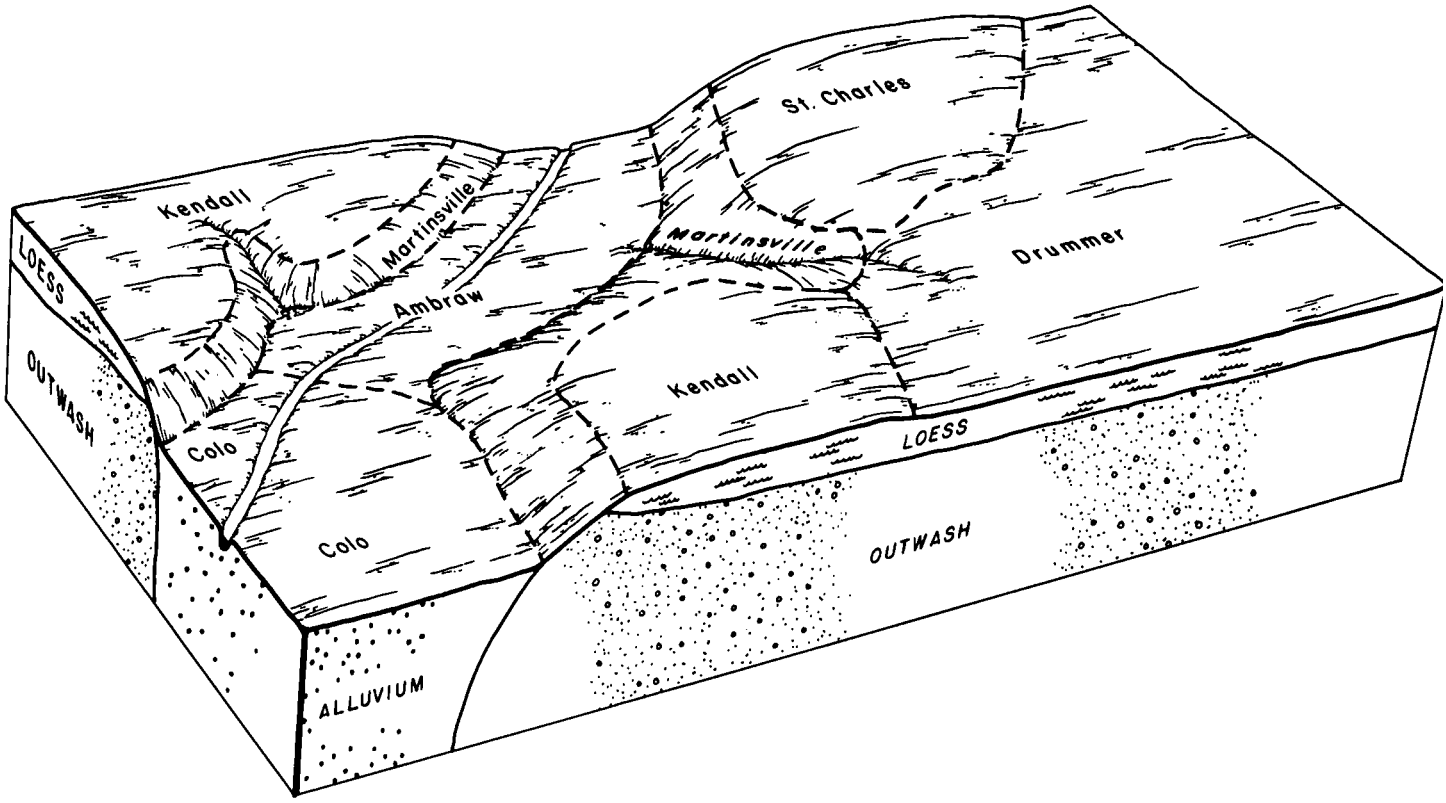

Figure 7.—Typical pattern of soils and parent material in the Drummer-Kendall-St. Charles association.

upper part is yellowish brown, mottled silty clay loam; the next part is mottled gray and yellowish brown silty clay loam; and the lower part is gray, mottled loam. The underlying material to a depth of 60 inches is mottled gray and strong brown, stratified silt loam, loam, and sandy loam.

The gently sloping, moderately well drained St. Charles soils are in areas above the Kendall and Drummer soils. Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 45 inches thick. The upper part is brown and dark yellowish brown silty clay loam; the next part is dark yellowish brown and yellowish brown, mottled silty clay loam and silt loam; and the lower part is yellowish brown, mottled silt loam stratified with loamy sand. The underlying material to a depth of 60 inches is yellowish brown loam.

Minor in this association are Ambraw, Camden, Colo, Martinsville, Millbrook, and Ockley soils. The poorly drained Ambraw and Colo soils are in small areas on the upper parts of bottom land. The well drained Camden, Martinsville, and Ockley soils occur as areas closely intermingled with areas of the St. Charles soils. The somewhat poorly drained Millbrook soils are on slight rises above the Drummer soils and closely intermingled with areas of the Kendall soils.

Most of this association is used for cultivated crops, but some of the acreage is used for hay, pasture, or trees. The soils are well suited to the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Available water capacity is high in all of the major soils. Fertility also is high. The content of organic matter is high in the Drummer soils but is moderately low in the Kendall and St. Charles soils. The main management needs are measures that control erosion and soil blowing, maintain the drainage system in the Drummer soils, and maintain tilth and fertility.

Nearly level to strongly sloping soils formed in loess or silty and clayey sediments and in glacial till on till plains

These soils are on till plains and glacial moraines characterized by swells and hills and by low areas. Also evident are short, steep slopes and small areas of bottom land.

7. Varna-Elliott-Ashkum association

Nearly level to sloping, moderately well drained to poorly drained, silty soils on till plains

This association is on ground moraines made up of swells and swales. Differences in elevation between the swells and the swales range from about 50 to 100 feet. The soils on the swells are gently sloping and sloping. The low areas are nearly level and commonly are closely intermingled with the more sloping areas.

This association makes up about 6 percent of the county. It is about 30 percent Varna soils, 30 percent Elliott soils, 25 percent Ashkum soils, and 15 percent minor soils (fig. 8).

The gently sloping or sloping, moderately well drained Varna soils are on ridgetops above and side slopes below the Elliott soils. Typically, the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is very dark gray silty clay loam about 4 inches thick. The subsoil is about 29 inches thick. The upper part is brown and olive brown silty clay, and the lower part is olive brown and olive, mottled silty clay loam. The underlying material to a depth of 60 inches is olive gray, mottled, calcareous silty clay loam.

The gently sloping, somewhat poorly drained Elliott soils are on gentle rises above the Ashkum soils and on toe slopes below the Varna soils. Typically, the surface layer is black silt loam about 12 inches thick. The subsoil is about 29 inches thick. It is light olive brown and mottled. The upper part is silty clay, and the lower part is silty clay loam. The underlying material to a depth of 60 inches is mottled gray and light olive brown, calcareous silty clay loam.

The nearly level, poorly drained Ashkum soils are in drainageways below the Varna and Elliott soils. Typically, the surface soil is black silty clay loam about 17 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is dark grayish brown and dark gray silty clay, and the lower part is gray silty clay loam. The underlying material to a depth of 72 inches is mottled gray and yellowish brown, calcareous silty clay loam.

Minor in this association are Brenton, Jasper, and Peotone soils. The somewhat poorly drained Brenton soils occur as areas closely intermingled with areas of the Elliott soils. The well drained Jasper soils occur as areas closely intermingled with areas of the Varna soils. The very poorly drained Peotone soils are in enclosed depressions.

Most of this association is used for cultivated crops, but a few areas are used for hay and pasture. The soils are well suited to the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. The content of organic matter is high in the Elliott and Ashkum soils and moderate in the Varna soils. Available water capacity is high in the Ashkum soils and moderate in the Varna and Elliott soils. The main management needs are measures that control erosion and soil blowing, maintain the drainage system in the Elliott and Ashkum soils, and maintain tilth and fertility.

8. Elliott-Ashkum association

Nearly level and gently sloping, somewhat poorly drained and poorly drained, silty soils on till plains

This association is characterized by swells and by low areas. Also evident are some small areas of bottom land at the upper end of drainageways. The soils on the

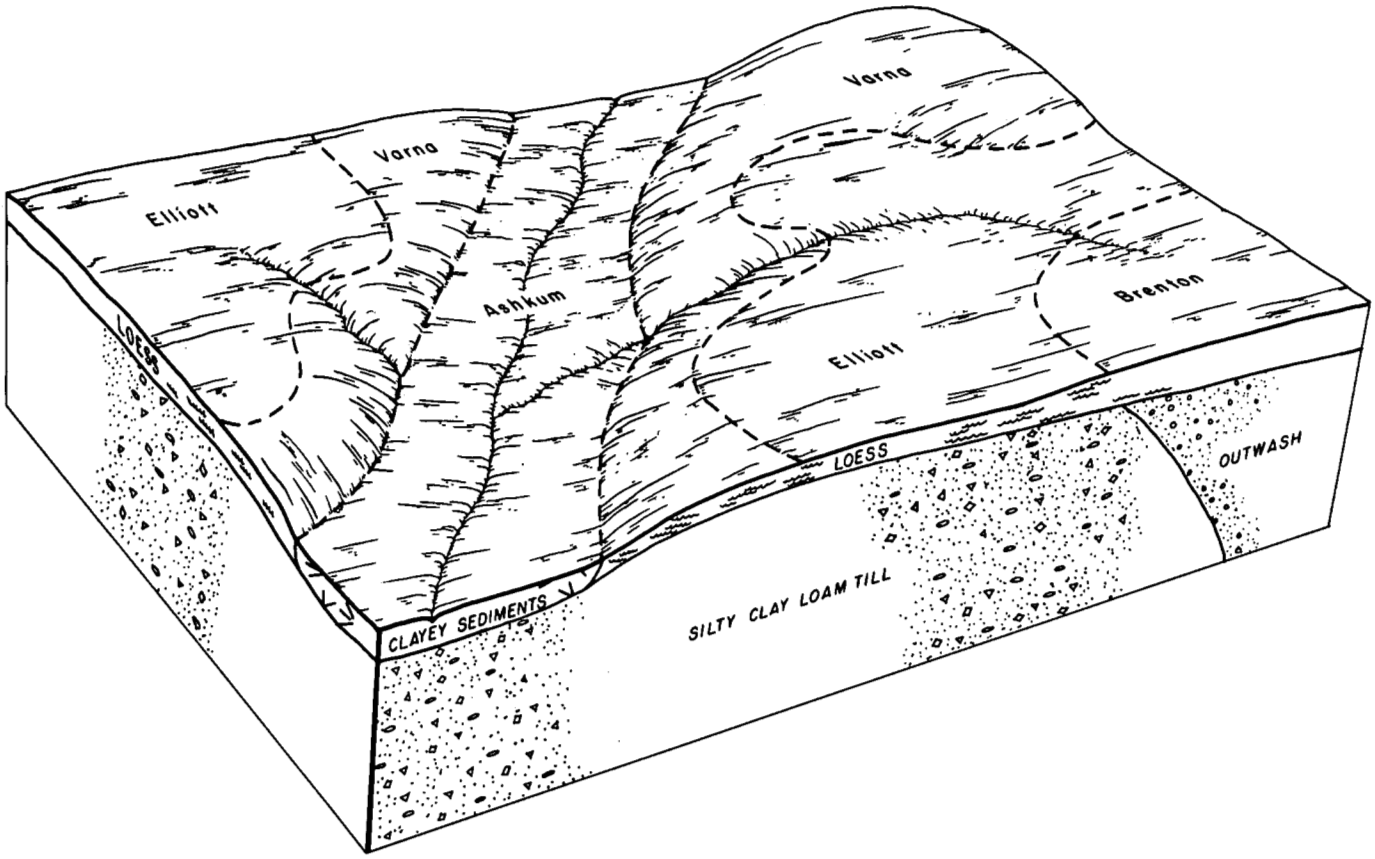

Figure 8.—Typical pattern of soils and parent material in the Varna-Elliott-Ashkum association.

swells have gentle slopes that are 100 to more than 1,000 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 6 percent of the county. It is about 45 percent Elliott soils, 35 percent Ashkum soils, and 20 percent minor soils.

The gently sloping, somewhat poorly drained Elliott soils are on gentle rises above the Ashkum soils. Typically, the surface layer is black silt loam about 12 inches thick. The subsoil is about 29 inches thick. It is light olive brown and mottled. The upper part is silty clay, and the lower part is silty clay loam. The underlying material to a depth of 60 inches is mottled gray and light olive brown, calcareous silty clay loam.

The nearly level, poorly drained Ashkum soils are in drainageways below the Elliott soils. Typically, the surface soil is black silty clay loam about 17 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is dark grayish brown and dark gray silty clay, and the lower part is gray silty clay loam. The underlying material to a depth of 72 inches is mottled gray and yellowish brown, calcareous silty clay loam.

Minor in this association are Brenton, Jasper, Peotone, and Varna soils. The somewhat poorly drained Brenton soils occur as areas closely intermingled with areas of the Elliott soils. The well drained Jasper and moderately well drained Varna soils are in areas above the Elliott soils. The very poorly drained Peotone soils are in enclosed depressions.

Most of this association is used for cultivated crops, but a few areas are used for hay and pasture. The soils are well suited to all of the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are high in both of the major soils. Available water capacity is moderate in the Elliott soils and high in the Ashkum soils. The main management needs are measures that control erosion and soil blowing and maintain the drainage system, tilth, and fertility.

9. Morley-Blount-Ashkum association

Nearly level to strongly sloping, moderately well drained to poorly drained, silty soils on till plains

This association is characterized by swells and by low areas. Also evident in many areas are short, steep slopes and bottom land less than one-quarter of a mile wide. The soils on the swells have gentle or strong slopes that are 100 to 500 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 1 percent of the county. It is about 25 percent Morley soils, 25 percent

Blount soils, 25 percent Ashkum soils, and 25 percent minor soils.

The gently sloping to strongly sloping, moderately well drained Morley soils are on side slopes and ridgetops above the Blount and Ashkum soils. Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 28 inches thick. The upper part is yellowish brown silty clay loam, and the lower part is light olive brown, mottled silty clay and silty clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous silty clay loam.

The nearly level and gently sloping, somewhat poorly drained Blount soils are on slight rises above the Ashkum soils. Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is brown, mottled silty clay loam; the next part is grayish brown, mottled silty clay; and the lower part is mottled yellowish brown and gray silty clay. The underlying material to a depth of 60 inches is yellowish brown, mottled, calcareous silty clay loam.

The nearly level, poorly drained Ashkum soils are in drainageways below the Blount and Morley soils. Typically, the surface soil is black silty clay loam about 17 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is dark grayish brown and dark gray silty clay, and the lower part is gray silty clay loam. The underlying material to a depth of 60 inches is mottled gray and yellowish brown, calcareous silty clay loam.

Minor in this association are Ambraw, Camden, Colo, Drummer, and Ockley soils. The poorly drained Ambraw and Colo soils are on the flood plains that commonly dissect the association. The well drained Camden soils occur as areas closely intermingled with the gently sloping areas of Morley soils. The poorly drained Drummer soils occur as areas closely intermingled with areas of Ashkum soils. The well drained Ockley soils occur as areas closely intermingled with areas of the Morley soils.

Most of this association is used for cultivated crops, but some of the acreage is used for hay, pasture, or trees. The soils generally are suited to the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility, organic matter content, and available water capacity are high in the Ashkum soils. The content of organic matter is moderate or moderately low and available water capacity moderate in the Morley and Blount soils. The main management needs are measures that control erosion and soil blowing, maintain the drainage system in the Blount and Ashkum soils, and maintain tilth and fertility.

10. Swygert-Bryce association

Nearly level and gently sloping, somewhat poorly drained and poorly drained, silty and clayey soils on till plains

This association is characterized by swells and by low areas. The soils on the swells have gentle slopes that are 100 to more than 1,000 feet long. Those in the low areas are nearly level to depressional.

This association makes up about 1 percent of the county. It is about 50 percent Swygert soils, 20 percent Bryce soils, and 30 percent minor soils.

The gently sloping, somewhat poorly drained Swygert soils are on rises above the Bryce soils. Typically, the surface soil is very dark gray silty clay loam about 12 inches thick. The subsoil is silty clay about 26 inches thick. The upper part is light olive brown and olive and is mottled, and the lower part is mottled gray and light olive brown. The underlying material to a depth of 60 inches is mottled gray and olive, calcareous silty clay.

The nearly level, poorly drained Bryce soils are in drainageways below the Swygert soils. Typically, the surface soil is black and very dark gray silty clay about 14 inches thick. The subsoil is dark gray and olive gray, mottled silty clay about 36 inches thick. The underlying material to a depth of 60 inches is mottled gray and olive, calcareous silty clay.

Minor in this association are Ashkum, Chatsworth, Elliott, Mona, and Varna soils. The poorly drained Ashkum soils occur as areas closely intermingled with areas of the Bryce soils. The moderately well drained Chatsworth, Mona, and Varna soils are on knolls above the Swygert soils. The somewhat poorly drained Elliott soils occur as areas closely intermingled with areas of the Swygert soils.

Most of this association is used for cultivated crops, but a few areas are used for hay and pasture. The soils generally are well suited to the crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are high in both of the major soils. Available water capacity is moderate. The main management needs are measures that control erosion and soil blowing and maintain the drainage system, tilth, and fertility.

Nearly level soils formed in alluvium on flood plains

These soils are on broad bottom land characterized by swells and by low areas. Also evident in some areas are low stream terraces and a few terrace breaks.

11. Colo-Ross association

Nearly level, poorly drained and well drained, silty soils on flood plains

This association is on bottom land characterized by

swells and by low areas. Relief in this association is 5 feet or less.

This association makes up about 1 percent of the county. It is about 70 percent Colo soils, 20 percent Ross soils, and 10 percent minor soils.

The poorly drained Colo soils are in areas below the Ross soils. Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is black and very dark gray, mottled silty clay loam about 29 inches thick. The subsoil is very dark gray, mottled silty clay loam about 12 inches thick. The underlying material to a depth of 68 inches is mottled dark grayish brown and gray clay loam.

The well drained Ross soils are on slight rises above the Colo soils. Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsurface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is brown loam about 34 inches thick. The underlying material to a depth of 63 inches also is brown loam.

Minor in this association are Ambraw, Camden, and Martinsville soils. The poorly drained Ambraw soils occur as areas closely intermingled with areas of the Colo soils. The well drained Camden and Martinsville soils are on stream terraces above the Colo and Ross soils.

Most of this association is used for pasture, hay, or trees, but many areas are used for cultivated crops. If protected from flooding, the soils generally are suited to the cultivated crops commonly grown in the county and to pasture and hay. Corn, soybeans, small grain, and hay grow well. Fertility and the content of organic matter are high in both of the major soils. Available water capacity is high in the Colo soils and very high in the Ross soils. The main management needs are measures that protect crops from floodwater, improve drainage in the Colo soils, and maintain tilth and fertility.

broad land use considerations

The soils in Champaign County vary widely in their suitability for major land uses. More than 80 percent of the acreage is used for cultivated crops, dominantly corn and soybeans. Most of the acreage in associations 1 through 10 is cultivated. Wetness is the main limitation and erosion the main hazard affecting the use of these associations for crops. Drummer, Flanagan, Elburn, Raub, Dana, Parr, Elliott, and Ashkum soils are the main soils in these associations. The soils in association 11 are commonly flooded, mainly in winter and early in spring. The floodwater causes slight to moderate crop damage. Wetness is the major limitation affecting the use of this association for crops. Colo and Ross soils are the major soils in this association, and Ambraw soils are the most extensive minor soils.

A small acreage in the county is pastured. All associations are suitable for grasses and legumes. The dominant soils throughout the associations are Drummer, Flanagan, Parr, Dana, Raub, Elburn, Elliott, Ashkum, and Varna soils on uplands and Colo, Ambraw, and Ross soils on flood plains.

A small acreage in the county is woodland. Suitability for trees is good or excellent in all associations. On some of the soils, equipment limitations are moderate or severe, but they can be overcome by harvesting during the drier periods or by using special equipment.

A few areas in the county are developed or built up for urban uses. In general, the gently sloping and sloping Parr, Miami, and Martinsville soils are the best soils for these uses. They are mainly in associations 3, 4, and 6. In most of the other associations, low strength, frost action, wetness, and slope are the chief limitations. Soils on flood plains, such as those in association 11, are generally unsuitable for urban development because of the flooding.

Much of the urban development in Champaign County depends on the use of private sewage disposal systems. Camden, Jasper, and Parr soils, which are mainly in associations 3, 5, and 6, have high or very high potential for onsite septic systems (*11*). In contrast, Ashkum, Colo, and Morley soils, which are mainly in associations 7, 8, 9, and 11, have low or very low potential for this use.

The suitability of the associations for recreational uses ranges from good to poor, depending upon the intensity of the expected use. Association 11 is poorly suited to many of these uses because of flooding. All of the associations are suitable for some recreational uses, such as paths and trails for hiking or horseback riding. Small areas suitable for intensive development generally are available in the associations that are otherwise poorly suited.

The suitability for wildlife habitat generally is good throughout the county. Associations 1 through 10 generally are well suited to habitat for openland and woodland wildlife. In associations 4, 6, 9, and 11, scattered areas are suitable for wetland wildlife habitat.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami silt loam, 2 to 5 percent slopes, is one of several phases in the Miami series.

Some map units are made up of two or more major soils. These map units are called soil complexes. In this survey area a *soil complex* occurs as areas of a soil mixed with areas of Urban land. The areas are so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soil and the Urban land are somewhat similar in all areas. Flanagan-Urban land complex, 0 to 3 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

23A—Blount silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is in plane and concave areas on till plains. Individual areas are irregular in shape and range from 2 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is brown, mottled, firm silty clay loam; the next part is grayish brown, mottled, firm silty clay; and the lower part is mottled yellowish brown and gray, firm silty clay. The underlying material to a depth of 60 inches is yellowish brown, mottled, calcareous silty clay loam. In places the surface layer is darker. In some areas the subsoil and underlying material contain less clay and more silt. In other areas the underlying material is stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the moderately well drained Morley soils. Ashkum soils are in shallow depressions and drainageways below the Blount soil, and Morley soils are on slight rises above the Blount soil. Included soils make up 2 to 9 percent of the unit.

Water and air move through the Blount soil at a slow or moderately slow rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from very strongly acid to

mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer tends to crust after spring and summer rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to pasture and hay and to habitat for woodland and openland wildlife and is moderately well suited to cultivated crops. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

The plants grazed by livestock or harvested for hay grow well on this soil. Deferment of grazing when the soil is too wet helps to prevent surface compaction, excessive runoff, and poor tilth. Either a combination of subsurface tile and surface inlets or a shallow surface drainage system can help to drain low spots on hayland. Unmowed strips, 30 to 50 feet wide, at the edge of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered, however, by installing foundation drains. If the soil is used as a septic tank absorption field, the seasonal high water table and the slow permeability are limitations. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIw.

23B—Blount silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on short, uneven side slopes and ridgetops on till plains. Individual areas are irregular in shape and range from 2 to 200 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is grayish brown, mottled silty clay about 28 inches thick. The upper part is firm, and the lower part is very firm. The underlying material to a depth of 60 inches is grayish brown, mottled, calcareous silty clay loam. In some areas the surface layer is thicker and darker. In other areas the underlying material is grayish brown, stratified loam and sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Morley soils. These soils are higher on the landscape than the Blount soil. They make up 2 to 8 percent of the unit.

Water and air move through the Blount soil at a slow or moderately slow rate. Surface runoff is medium in cultivated areas. The seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from very strongly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for pasture or hay, but a large acreage is used for cultivated crops or for trees. This soil is well suited to pasture and hay and to openland wildlife habitat and is moderately well suited to cultivated crops. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. If cultivated crops are grown, erosion is the main hazard and wetness the main limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these help to control erosion. Measures that maintain the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

The plants grazed by livestock or harvested for hay grow well on this soil. Overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered, however, by installing foundation drains. If the soil is used as a septic tank absorption field, the seasonal high water table and the slow permeability are limitations. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

27B—Miami silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges on upland till plains. Individual areas are irregular in shape and range from 2 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is about 28 inches thick. The upper part is yellowish brown, friable silty clay loam; the next part is brown, firm clay loam; and the lower part is mottled brown and light olive brown, friable loam. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam. In some areas the subsoil contains less sand. In other areas the surface

layer is darker. In places the depth to the underlying material is more than 40 inches.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Sabina soils. These soils are in shallow depressions and drainageways below the Miami soil. They make up 2 to 8 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. Reaction is medium acid in the upper part of the subsoil and mildly alkaline in the lower part. It varies in the surface layer as a result of local liming practices. Available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust after hard rains. The potential for frost action and the shrink-swell potential are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for woodland and openland wildlife, and lawns and landscaping. It is moderately well suited to dwellings, septic tank absorption fields, and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by terraces, contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, or a combination of these. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth and increases the rate of water intake.

Erosion can be held within tolerable limits by establishing pasture plants or hay on this soil. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, pasture and hayland should be tilled on the contour when a seedbed is prepared.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the moderate or moderately slow permeability is a limitation. It can be overcome, however, by enlarging the absorption area.

The capability subclass is IIe.

27C2—Miami silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on knolls and short, uneven side slopes near the major streams in the uplands. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 23 inches thick. The upper part is yellowish brown, friable silty clay loam; the next part is brown, firm clay loam; and the lower part is brown, friable loam. The underlying material to a depth of 60 inches is light olive brown and light yellowish brown, calcareous loam. In some areas the subsoil is exposed. In other areas the content of sand in the subsoil is less than 15 percent. In places the depth to the underlying material is greater.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Miami soil. They make up 1 to 5 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content is moderately low. Reaction is medium acid in the upper part of the subsoil and mildly alkaline in the lower part. It varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The potential for frost action and the shrink-swell potential are moderate.

Most areas are used for pasture or hay. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and lawns and landscaping. It is moderately well suited to dwellings, septic tank absorption fields, and local roads and streets.

If this soil is used for cultivated crops, further erosion is a hazard. A crop rotation in which forage crops are grown for 1 year or more, a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these are needed to control erosion and thus maintain the productivity of the soil. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the moderate or moderately slow permeability is a limitation. It can be overcome, however, by enlarging the absorption area.

The capability subclass is IIIe.

27D2—Miami silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on short, uneven side slopes adjacent to flood plains. Individual areas are irregularly shaped or linear and range from 4 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is grayish brown, friable silt loam about 2 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown and brown, firm clay loam, and the lower part is brown, friable loam. The underlying material to a depth of 60 inches is light olive brown and light yellowish brown, calcareous loam. In some areas, the subsoil is thinner and the underlying material contains more clay and less sand. In other areas the underlying material is stratified, loamy outwash.

Included with this soil in mapping are small areas of the poorly drained Ambraw and Colo soils. These soils are on alluvial bottom land below the Miami soil. They make up 1 to 5 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is rapid in cultivated areas. Available water capacity is moderate. Organic matter content is moderately low. Reaction is medium acid in the upper part of the subsoil and mildly alkaline in the lower part. It is medium acid to neutral in the surface soil. The potential for frost action and the shrink-swell potential are moderate.

Most areas are wooded. This soil is well suited to woodland wildlife habitat. It is moderately well suited to pasture and hay, dwellings, septic tank absorption fields, and local roads and streets. It is poorly suited to cultivated crops.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, pasture and hayland should be tilled on the contour when a seedbed is prepared.

The wooded areas of this soil provide good habitat for woodland wildlife. Measures that exclude livestock help to prevent the depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope. If the soil is used as a septic tank absorption field, the slope and the moderate or moderately slow permeability are limitations. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. Installing the filter lines on the contour helps to overcome the slope.

The capability subclass is IVe.

27E2—Miami silt loam, 15 to 25 percent slopes, eroded. This steep, well drained soil is on uneven side slopes adjacent to flood plains. Individual areas are linear and range from 4 to 60 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 7 inches thick. The subsurface layer is grayish brown, friable silt loam about 2 inches thick. The subsoil is about 16 inches thick. The upper part is yellowish brown and brown, firm clay loam, and the lower part is light olive brown, friable loam. The underlying material to a depth of 60 inches is light olive brown, calcareous loam. In some areas, the subsoil is thinner and the underlying material contains more clay. In other areas the underlying material is stratified, loamy outwash.

Included with this soil in mapping are small areas of the poorly drained Ambraw and Colo soils. These soils are on alluvial bottom land below the Miami soil. They make up 1 to 7 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is rapid in pastured areas. Available water capacity is moderate. Organic matter content is moderately low. Reaction is neutral in the upper part of the subsoil and mildly alkaline or moderately alkaline in the lower part. It is slightly acid or neutral in the surface layer. The potential for frost action and the shrink-swell potential are moderate.

Most areas are wooded. This soil is well suited to woodland wildlife habitat and is moderately well suited to nature paths and trails. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets and generally is unsuited to cultivated crops and hay.

If this soil is used for woodland wildlife habitat, measures that exclude livestock are needed. These measures help to prevent the depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

Nature paths and trails can be established on this soil. Stairways and handrails are needed in the steeper areas. Erosion is the main hazard if the plant cover is removed, for example, during the construction of the paths and trails.

If this soil if used as a site for dwellings, the shrink-swell potential and the slope are limitations. Reinforcing foundations helps to prevent the structural damage caused by the shrinking and swelling. Cutting and filling help to overcome the slope. If the soil is used as a septic tank absorption field, the slope and the moderate or moderately slow permeability are limitations. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. Installing the filter lines on the contour helps to overcome the slope.

The capability subclass is VIe.

56B—Dana silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the tops of ridges on till plains and moraines. Individual

areas are irregular in shape and range from 4 to 100 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 38 inches thick. It is friable and mottled. The upper part is brown and yellowish brown silty clay loam; the next part is yellowish brown clay loam; and the lower part is light olive brown loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam. In places the surface soil is thinner or lighter in color. In some areas, the upper part of the subsoil contains more sand and carbonates are closer to the surface. In other areas stratified, loamy outwash is mixed with the loam till in the underlying material.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Flanagan and Raub soils. These soils are in shallow depressions and drainageways below the Dana soil. They make up 3 to 8 percent of the unit.

Water and air move through the subsoil of the Dana soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, to openland wildlife habitat, and to lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the wetness is a limitation on sites for dwellings with basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing tile lines around the base of foundations reduces the wetness.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Unless the distribution lines are installed closer to the surface than is typical, measures that lower the water table are needed. Enlarging the absorption field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

67—Harpster silty clay loam. This nearly level, poorly drained soil is in slight depressions in outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are linear or horseshoe shaped and range from 2 to 80 acres in size.

Typically, the surface layer is black, friable, calcareous silty clay loam about 11 inches thick. The subsoil is about 30 inches thick. It is calcareous, friable, and mottled. The upper part is dark gray and gray silty clay loam, and the lower part is gray silt loam. The underlying material to a depth of 60 inches is mottled gray and yellowish brown, calcareous, stratified loam and silt loam. In some areas the surface layer does not have carbonates. In other areas the subsoil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton, Elburn, and Flanagan soils. These soils are on slight rises above the Harpster soil. They make up 1 to 8 percent of the unit.

Water and air move through the Harpster soil at a moderate rate. Surface runoff is slow to ponded in cultivated areas. A seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is very high. Organic matter content is high. The surface layer and subsoil are mildly alkaline or moderately alkaline. The surface layer is friable but is compact and cloddy if it has been plowed when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to openland wildlife habitat and is moderately well suited to pasture and hay. It is poorly suited to dwellings, lawns and landscaping, local roads and streets, and septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. No applications of lime are needed. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. The ponding can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. A drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the ponding is a hazard. Surface and subsurface drains are needed. Providing as much as 2 feet of loamy fill material is beneficial because it increases the depth to the seasonal high water table.

The capability subclass is IIw.

73—Ross silt loam. This nearly level, well drained soil is on bottom land. It is occasionally flooded for very brief

periods from March to June. Individual areas are irregular in shape and range from 2 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsoil is brown, friable loam about 34 inches thick. The underlying material to a depth of about 63 inches is brown loam. In places the surface soil is thinner and lighter in color. In some areas the surface soil and subsoil contain more sand. In other areas the underlying material is calcareous sand and gravel.

Included with this soil in mapping are small areas of the poorly drained Ambraw and Colo soils. These soils are in alluvial areas below the Ross soil. They make up 2 to 15 percent of the unit.

Water and air move through the Ross soil at a moderate rate. Surface runoff is slow in cultivated areas. Available water capacity is very high. Organic matter content is high. Reaction ranges from slightly acid to moderately alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The potential for frost action is moderate.

Most areas are used for pasture or hay. This soil is well suited to cultivated crops, to pasture and hay, and to habitat for openland and woodland wildlife. Because it is subject to flooding, it generally is unsuited to dwellings and septic tank absorption fields and is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, dikes or diversions are needed to reduce the extent of the crop damage caused by floodwater. Keeping tillage at a minimum and returning crop residue to the soil or regularly adding other organic material help to maintain fertility and tilth.

In the areas used for pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture and the soil in good condition. In the areas used for hay, the flooding delays harvesting during some years.

The capability subclass is IIw.

91B—Swygert silty clay loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on short, uneven side slopes and toe slopes on till plains and moraines. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam about 9 inches thick. The subsurface layer is very dark gray, firm silty clay loam about 3 inches thick. The subsoil is very firm silty clay about 26 inches thick. The upper part is light olive brown and olive and is mottled, and the lower part is mottled gray and light olive brown. The underlying material to a depth of 60 inches is mottled gray and olive, calcareous silty clay. In some areas the surface layer is thinner and lighter in color. In other areas, the subsoil is thicker and the depth to calcareous silty clay is greater.

Included with this soil in mapping are small areas of the poorly drained Ashkum and Bryce soils and the moderately well drained Mona soils. Ashkum and Bryce soils are in shallow depressions and drainageways below the Swygert soil, and Mona soils are on slight rises and knobs above the Swygert soil. Included soils make up 2 to 9 percent of the unit.

Water and air move through the Swygert soil at a slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content is high. Reaction ranges from slightly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer is compact and cloddy if it has been plowed when too wet. The shrink-swell potential and the potential for frost action are high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and wetness a limitation. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. A drainage system may be needed to improve productivity. Surface drains function satisfactorily if suitable outlets are available. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

In the areas used for pasture, overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Unmowed strips, 30 to 50 feet wide, at the edge of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains at the base of the foundation reduces the wetness.

If this soil is used as a septic tank absorption field, the seasonal high water table and the slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

102A—La Hogue loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad

outwash plains. Individual areas are irregular in shape and range from 2 to 150 acres in size.

Typically, the surface soil is black and very dark brown, friable loam about 16 inches thick. It is brown, mottled, and friable. The upper part is clay loam and sandy clay loam, and the lower part is sandy loam. The underlying material to a depth of 65 inches is mottled grayish brown, strong brown, gray, light olive gray, and brownish yellow, stratified sandy loam and silt loam. In places the surface soil is thinner and lighter in color. In some areas the lower part of the subsoil formed in calcareous loam glacial till. In other areas the upper part of the subsoil contains less sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils, the well drained Jasper soils, and the moderately well drained Proctor soils. Drummer soils are in shallow depressions and drainageways below the La Hogue soil. Jasper and Proctor soils are on side slopes and ridgetops above the La Hogue soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the La Hogue soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of the local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If this soil is used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil or regularly adding other organic material help to maintain fertility and tilth.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites used for dwellings without basements. Installing tile drains around foundations helps to lower the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs. Underground drains help to lower the water table in septic tank absorption fields.

The capability class is I.

125—Selma loam. This nearly level, poorly drained soil is on outwash plains and stream terraces. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are irregular in shape and range from 2 to 500 acres in size.

Typically, the surface soil is black, friable loam about 13 inches thick. The subsoil is about 33 inches thick. It is friable and mottled. The upper part is dark gray loam, and the lower part is gray loam and sandy loam. The underlying material to a depth of 73 inches is mottled gray and yellowish brown, stratified sandy loam, loamy sand, and silt loam. In some areas the surface soil and subsoil contain less sand and more silt. In a few areas the underlying material is calcareous silty clay loam or loam till.

Included with this soil in mapping are small areas of the well drained Jasper soils and the somewhat poorly drained Brenton and La Hogue soils. These soils are on slight rises and knobs above the Selma soil. They make up 2 to 5 percent of the unit.

Water and air move through the subsoil of the Selma soil at a moderate rate and through the underlying material at a moderately rapid rate. Surface runoff is very slow or ponded in cultivated areas. A seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from slightly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to habitat for openland wildlife and is moderately well suited to pasture and hay. It is poorly suited to dwellings and local roads and streets and generally is unsuited to septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings or septic tank absorption fields, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. The ponding on building sites can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Surface and subsurface drains are needed in septic tank absorption fields. Providing as much as 2 feet of loamy material is beneficial because it increases the depth to the seasonal high water table.

The capability subclass is IIw.

131B—Alvin sandy loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on outwash plains

and stream terraces. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, very friable sandy loam about 8 inches thick. The subsurface layer is brown and yellowish brown, very friable and friable sandy loam about 12 inches thick. The subsoil extends to a depth of 66 inches. The upper part is yellowish brown, friable sandy loam and loam, and the lower part is brown, friable, stratified loamy sand, sandy loam, and sandy clay loam. In some areas the surface layer is darker. In other areas the subsoil contains more clay and less sand.

Included with this soil in mapping are small areas of the poorly drained Colo soils and the somewhat poorly drained La Hogue soils. Colo soils are on bottom land below the Alvin soil. La Hogue soils are on outwash plains below the Alvin soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the subsoil of the Alvin soil at a moderately rapid rate. Surface runoff is slow in cultivated areas. Available water capacity is moderate. Organic matter content is low. Reaction is strongly acid or medium acid in the subsoil and varies in the surface layer as a result of local liming practices. The potential for frost action is moderate.

Most areas are wooded or used as recreational areas. This soil is well suited to habitat for openland and woodland wildlife, to pasture and hay, to picnic areas and recreational paths and trails, and to dwellings and septic tank absorption fields. It is moderately well suited to local roads and streets and to cultivated crops.

If this soil is used for corn, soybeans, or small grain, soil blowing is the main hazard. Also, the moderate available water capacity and the level of fertility are limitations. A system of conservation tillage that leaves crop residue on the surface after planting is effective in controlling soil blowing and water erosion and in conserving moisture.

The wooded areas provide good habitat for woodland wildlife. Measures that exclude livestock help to prevent the depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs on the woodland and farmstead windbreaks provide cover for doves and many songbirds. Planting suitable grasses and legumes, such as bromegrass, orchardgrass, and ladino, alsike, or red clover in open areas and at the border of wooded areas improve the habitat for pheasant and many other kinds of openland wildlife.

This soil can be developed for recreational uses, especially paths and trails and picnic areas. The adjacent uplands are better sites, however, for playgrounds and camp areas.

The capability subclass is IIe.

134B—Camden silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is in convex areas on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 48 inches thick. It is friable. The upper part is yellowish brown silt loam and silty clay loam, and the lower part is brown and yellowish brown loam and sandy loam. The underlying material to a depth of 77 inches is yellowish brown, stratified sandy loam, loam, and sandy clay loam. In places the surface soil is darker. In some areas the underlying material is calcareous loam. In other areas the upper part of the subsoil contains less silt and more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Kendall soils. These soils are in shallow depressions and drainageways below the Camden soil. They make up 5 to 15 percent of the unit.

Water and air move through the Camden soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, to habitat for openland and woodland wildlife, to lawns and landscaping, and to septic tank absorption fields. It is moderately well suited to dwellings and is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

Pasture plants and hay grow well on this soil. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

The capability subclass is IIe.

146B—Elliott silt loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on ridges and toe slopes on till plains and moraines. Individual

areas are irregular in shape and range from 2 to 300 acres in size.

Typically, the surface layer is black, friable silt loam about 12 inches thick. The subsoil is about 29 inches thick. It is firm, light olive brown, and mottled. The upper part is silty clay, and the lower part is silty clay loam. The underlying material to a depth of 60 inches is mottled gray and light olive brown, calcareous silty clay loam. In places the surface layer is thinner and contains subsoil material. In some areas, the subsoil is thicker and the depth to calcareous silty clay loam till is greater. In other areas the lower part of the subsoil is friable loam or sandy loam.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the moderately well drained Varna soils. Ashkum soils are in depressions and drainageways below the Elliott soil, and Varna soils are on side slopes below and ridgetops above the Elliott soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Elliott soil at a moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content is high. Reaction ranges from slightly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and wetness a limitation. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. A drainage system may be needed to improve productivity. Tile drains function satisfactorily if suitable outlets are available.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Underground drains help to lower the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

148B—Proctor silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges, knolls, and short, uneven side slopes on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface soil is very dark brown and very dark grayish brown, friable silt loam about 14 inches thick. The subsoil is about 36 inches thick. The upper part is brown, firm silty clay loam; the next part is brown, mottled, firm clay loam; and the lower part is light olive brown and olive brown, mottled, friable, stratified loam and sandy loam. The underlying material to a depth of 66 inches is dark yellowish brown and yellowish brown, stratified loam and sandy loam. In places the surface soil is thinner and lighter in color. In some areas part of the underlying material is calcareous loam or silty clay loam till. In other areas the subsoil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Elburn soils and the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Proctor soil. They make up 3 to 12 percent of the unit.

Water and air move through the Proctor soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 2.5 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, to openland wildlife habitat, and to lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile lines around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table is a limitation. The septic system functions properly only if the water table is lowered or the distribution lines are installed closer to the surface than is typical.

The capability subclass is IIe.

149A—Brenton silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on broad outwash plains. Individual areas are irregular in shape and range from 2 to 160 acres in size.

Typically, the surface soil is black and very dark gray, friable silt loam about 16 inches thick. The subsoil is

about 37 inches thick. It is brown and dark yellowish brown, mottled, and friable. The upper part is silty clay loam, and the lower part is clay loam. The underlying material to a depth of 72 inches is mottled brownish yellow and light gray, stratified silt loam and sandy loam In some areas the surface soil is thinner and lighter in color. In other areas, the upper part of the subsoil contains more sand and the underlying layers formed in gravel.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the moderately well drained Proctor soils. Drummer soils are in shallow depressions and drainageways below the Brenton soil, and Proctor soils are on slopes above the Brenton soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Brenton soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In the areas used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. It can be lowered, however, by installing underground drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

The capability class is I.

150B—Onarga sandy loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on broad outwash plains. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 12 inches thick. The subsoil is about 37 inches thick. It is very friable. The upper part is brown sandy loam and sandy clay loam, and the lower part is dark yellowish brown and brown sandy loam. The underlying material to a depth of 65 inches is yellowish brown sand that has bands of loamy sand. In some areas the surface layer contains more silt and less sand. In other areas the lower part of the subsoil has gray mottles. In a few places the content of clay is less than 15 percent in the subsoil.

Included with this soil in mapping are small areas of the poorly drained Drummer and Selma soils, the somewhat poorly drained La Hogue soils, and the moderately well drained Proctor soils. Drummer, La Hogue, and Selma soils are in shallow depressions and drainageways below the Onarga soil, and Proctor soils are in positions on the landscape similar to those of the Onarga soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the subsoil of the Onarga soil at a moderately rapid rate and through the underlying material at a rapid rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. The potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, dwellings, septic tank absorption fields, and lawns and landscaping. It is moderately well suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

The capability subclass is IIe.

152—Drummer silty clay loam. This nearly level, poorly drained soil is on upland flats and in shallow depressions and drainageways on outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring Individual areas are irregular in shape. They average about 50,000 acres in size but range from 2 to more than 100,000 acres.

Typically, the surface soil is black, firm silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is very dark gray and dark gray, firm silty clay loam; the next part is grayish brown and yellowish brown, firm silty clay loam; and the lower part is yellowish brown, friable loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam. In a few places the surface soil is thicker and contains more clay. In some areas the underlying material is dark gray loam or clay loam glacial till. In a few areas carbonates are within a depth of 35 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton, Elburn, and Flanagan soils and the moderately well drained Catlin and Dana soils. These soils are on knobs and rises

above the Drummer soil. They make up 2 to 8 percent of the unit.

Water and air move through the Drummer soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table ranges from 0.5 feet above the surface to 2.0 feet below during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from medium acid to moderately alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer is firm and is compact and cloddy if it has been plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to openland wildlife habitat and is moderately well suited to pasture and hay. It is poorly suited to dwellings, lawns and landscaping, local roads and streets, and septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain (fig. 9). Measures that maintain the drainage system are needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Figure 9.—Corn and soybeans on Drummer silty clay loam and the included lighter colored Flanagan soils.

If this soil is used as a site for dwellings, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Lowering the water table with underground drains and installing surface drains help to control the ponding. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, a drainage system is needed. Also, providing as much as 2 feet of loamy fill material is beneficial because it increases the depth to the seasonal high water table.

Low strength, ponding, the potential for frost action, and shrinking and swelling are limitations if this soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage resulting from low strength and from shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and frost action.

The capability subclass is IIw.

153—Pella silty clay loam. This nearly level, poorly drained soil is on upland flats and in depressions in outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface soil is black and very dark gray, friable and firm silty clay loam about 15 inches thick. The subsoil is about 19 inches thick. The upper part is light brownish gray, mottled, firm silty clay loam, and the lower part is light brownish gray, mottled, friable, calcareous silt loam. The underlying material to a depth of 60 inches is gray, mottled, calcareous, stratified silt loam and loamy sand. In some areas the depth to the calcareous lower part of the subsoil is greater. In other areas the underlying material contains less sand. In a few places the surface soil is thicker and contains more clay.

Included with this soil in mapping are small areas of the moderately well drained Catlin soils and the somewhat poorly drained Elburn and Flanagan soils. These soils are on slight rises above the Pella soil. They make up 2 to 5 percent of the unit.

Water and air move through the Pella soil at a moderate rate. Surface runoff is slow to ponded in cultivated areas. A seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is high. Organic matter content also is high. Reaction is mildly alkaline or moderately alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The surface soil is compact and cloddy if it has been plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to openland wildlife habitat and is moderately well suited to pasture and hay. It is poorly suited to dwellings, lawns and landscaping, local roads and streets, and septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard. It can be controlled, however, by lowering the water table with underground drains and by installing surface drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundations, however, helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, surface and subsurface drains are needed. Also, providing as much as 2 feet of loamy fill material is beneficial because it increases the depth to the seasonal high water table.

The capability subclass is IIw.

154A—Flanagan silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on till plains and on toe slopes on moraines. Individual areas are irregular in shape and range from 2 to more than 500 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part is mottled yellowish brown, light olive brown, brown, and light brownish gray, friable and firm silt loam. The underlying material to a depth of 60 inches is yellowish brown, mottled, calcareous loam. In some areas the subsoil is thicker and the depth to calcareous loam greater. In other areas a subsoil of clay loam is within a depth of 40 inches. In a few places the underlying material is yellowish brown sandy loam, loamy sand, or sand.

Included with this soil are small areas of the moderately well drained Catlin and Dana soils and the poorly drained Drummer soils. Catlin and Dana soils are on slight rises above the Flanagan soil, and Drummer soils are in depressions and drainageways below the Flanagan soil. Included soils make up 2 to 7 percent of the unit.

Water and air move through the Flanagan soil at a moderately slow rate. Surface runoff is slow in cultivated

areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The shrink-swell potential and the potential for frost action are high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In the areas used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing underground drains helps to lower the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

Low strength, the potential for frost action, and the shrink-swell potential are limitations if this soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage resulting from low strength and from shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water reduce wetness and thus help to prevent the damage caused by frost action.

The capability class is I.

171B—Catlin silt loam, 2 to 7 percent slopes. This gently sloping, moderately well drained soil is on ridges on till plains and moraines. Individual areas are irregular in shape and range from 2 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, mottled, friable silty clay loam, and the lower part is light olive brown, mottled, firm clay loam. The underlying material to a depth of 70 inches is light olive brown, calcareous loam. In some areas the surface layer is thinner and lighter in color. In other areas the underlying material is noncalcareous, stratified outwash. In a few places, the subsoil is thinner and glacial till is closer to the surface.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Elburn and Flanagan soils. These soils are in drainageways and on slopes below the Catlin soil. They make up 2 to 10 percent of the unit.

Water and air move through the Catlin soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.5 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile lines around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table is a limitation. The septic system functions properly only if the water table is lowered or the distribution lines are installed closer to the surface than is typical.

The capability subclass is IIe.

194B—Morley silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges and toe slopes on till plains. Individual areas are irregular in shape and range from 2 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is yellowish brown, friable silt loam about 3 inches thick. The subsoil is about 31 inches thick. It is firm. The upper part is yellowish brown silty clay loam; the next part is light olive brown, mottled silty clay; and the lower part is light olive brown, mottled silty clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous silty clay loam. In places the surface layer and subsurface layer are thinner. In some areas the subsoil contains less clay. In other areas the underlying material is yellowish brown, stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the somewhat poorly drained Blount soils. These soils are in shallow

depressions and drainageways below the Morley soil. They make up 2 to 8 percent of the unit.

Water and air move through the Morley soil at a slow or moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to moderately alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer crusts in some cultivated areas after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to pasture and hay, to habitat for openland and woodland wildlife, and to lawns and landscaping. It is moderately well suited to cultivated crops and to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

In the areas used for forage plants, pasture rotation, timely deferment of grazing, and applications of fertilizer are needed to prevent surface compaction, excessive runoff, and poor tilth. Unmowed strips, 30 to 50 feet wide, at the edge of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile lines around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table and the slow or moderately slow permeability are limitations. The septic system functions properly only if measures that lower the water table and enlarge the absorption area are applied successfully. If these measures cannot overcome the limitations, an alternative system of sewage disposal, such as a sand filter, should be selected.

The capability subclass is IIe.

194C2—Morley silt loam, 5 to 12 percent slopes, eroded. This sloping, moderately well drained soil is on knolls and short, uneven side slopes adjacent to alluvial bottom land. Individual areas are irregular in shape and range from 2 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 28 inches thick. It is firm. The upper part is yellowish brown silty clay loam, and the lower part is light olive brown, mottled silty clay and silty clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous silty clay loam. In places the surface layer is darker. In some areas the subsoil contains less clay. In other areas the underlying material is yellowish brown, stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the somewhat poorly drained Blount soils. These soils are in shallow depressions and drainageways. They make up 2 to 7 percent of the unit.

Water and air move through the Morley soil at a slow or moderately slow rate. Surface runoff is rapid in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used for pasture or hay. This soil is well suited to pasture and hay and to habitat for openland and woodland wildlife. It is moderately well suited to cultivated crops and to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation in which forage crops are grown for 1 year or more, a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these can keep soil loss at an acceptable level and thus maintain the productivity of the soil. Returning crop residue to the soil helps to maintain tilth and fertility.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains at the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope.

If this soil is used as a septic tank absorption field, the seasonal high water table, the slow or moderately slow permeability, and the slope are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. Installing the filter lines on the contour helps to overcome the slope.

The capability subclass is IIIe.

194D2—Morley silt loam, 12 to 20 percent slopes, eroded. This moderately steep, moderately well drained soil is on short, uneven side slopes adjacent to stream terraces and bottom land. Individual areas are linear and range from 2 to 100 acres in size.

Typically, the surface layer is mixed dark grayish brown and brown, friable silt loam about 6 inches thick. The subsoil is about 20 inches thick. It is firm. The upper part is yellowish brown silty clay loam, and the lower part is light olive brown, mottled silty clay and silty clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous silty clay loam. In some areas the surface layer and subsoil are thinner. In other areas the subsoil contains less clay and more sand. In a few places the underlying material is yellowish brown, stratified loam and sandy loam.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils are on alluvial bottom land below the Morley soil. They make up 0 to 5 percent of the unit.

Water and air move through the Morley soil at a slow or moderately slow rate. Surface runoff is rapid in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content is moderately low. Reaction ranges from medium acid to mildly alkaline in the subsoil and is neutral or slightly acid in the surface layer. The shrink-swell potential and the potential for frost action are moderate.

Most areas are wooded. This soil is well suited to woodland wildlife habitat and is moderately well suited to pasture and hay. It is poorly suited to cultivated crops and to dwellings, septic tank absorption fields, and local roads and streets.

This soil provides good habitat for woodland wildlife. Measures that exclude livestock help to prevent the depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

Nature paths and trails can be established in the areas where the slope is less than 15 percent. In some of the steeper areas, land leveling and stairways or handrails are needed. Erosion is the main hazard if the plant cover is removed, for example, during the construction of the paths and trails.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains at the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope.

If this soil is used as a septic tank absorption field, the seasonal high water table, the slow or moderately slow permeability, and the slope are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. Installing the filter lines on the contour helps to overcome the slope.

The capability subclass is IVe.

198A—Elburn silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on outwash plains. Individual areas are irregular in shape and range from 2 to 160 acres in size.

Typically, the surface soil is very dark gray, friable silt loam about 16 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam; the next part is mottled grayish brown and yellowish brown, friable silty clay loam; and the lower part is light brownish gray, mottled, friable silt loam stratified with loam and sandy loam. The underlying material to a depth of 60 inches is mottled grayish brown and yellowish brown sandy loam stratified with coarse sand. In places the surface soil is thinner and lighter in color. In some areas the lower part of the subsoil formed in calcareous, brown loam glacial till. In other areas the subsoil contains more sand.

Included with this soil in mapping are small areas of the moderately well drained Catlin and Plano soils and the poorly drained Drummer soils. Catlin and Plano soils are on slight rises above the Elburn soil, and Drummer soils are in drainageways and depressions below the Elburn soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Elburn soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. The surface soil and subsoil range from medium acid to mildly alkaline. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In the areas used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Installing drainage tile around foundations helps to lower the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table is a limitation. It can be lowered, however, by underground drains.

The capability class is I.

199B—Plano silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on upland ridges and short, uneven side slopes on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface soil is very dark grayish brown and dark brown, friable silt loam about 16 inches thick. The subsoil is about 46 inches thick. It is friable. The upper part is brown and yellowish brown silty clay loam; the next part is yellowish brown, mottled silty clay loam; and the lower part is yellowish brown, mottled, stratified silt loam and loam. The underlying material to a depth of 70 inches is light olive brown, mottled, stratified silt loam, loam, and sandy loam. In places the surface soil is thinner and lighter in color. In some areas part of the underlying material is calcareous loam or silty clay loam till. In other areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Elburn soils. These soils are in shallow depressions and drainageways below the Plano soil. They make up 3 to 12 percent of the unit.

Water and air move through the Plano soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. Reaction is slightly acid or medium acid in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing drainage tile around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table is a limitation. The septic system functions properly only if the water table is lowered or the distribution lines are installed closer to the surface than is typical.

The capability subclass is IIe.

206—Thorp silt loam. This nearly level, poorly drained soil is in shallow depressions in outwash plains and till plains. It is occasionally flooded or ponded for brief periods from March to June. Individual areas are round or oblong and range from 2 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsurface layer is grayish brown, friable silt loam about 6 inches thick. The subsoil is about 47 inches thick. The upper part is grayish brown, mottled, friable silty clay loam; the next part is gray, mottled, firm silty clay loam; and the lower part is mottled gray and light gray, friable, stratified loam and silt loam. In some areas the surface layer is thinner. In other areas it is silty clay loam and is not underlain by a subsurface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Flanagan soils and the well drained Wea soils. These soils are on slight rises above the Thorp soil. They make up 1 to 5 percent of the unit.

Water and air move through the subsoil of the Thorp soil at a slow rate. Surface runoff is slow to ponded in cultivated areas. A seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is very high. Organic matter content is moderate. The surface layer is cloddy if it has been plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to openland wildlife habitat and is moderately well suited to pasture and hay. Because it is subject to flooding and ponding, it is poorly suited to local roads and streets and is generally unsuited to dwellings and septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains and surface drains generally function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used for pasture or hay, harvesting or grazing during wet periods and overgrazing reduce

forage production and cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture and the soil in good condition.

The capability subclass is IIw.

219—Millbrook silt loam. This nearly level, somewhat poorly drained soil is on broad outwash plains. Individual areas are irregular in shape and range from 2 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 41 inches thick. The upper part is mottled yellowish brown and gray, friable silty clay loam, and the lower part is mottled gray and yellowish brown, friable clay loam and sandy loam. The underlying material to a depth of 60 inches is mottled gray and yellowish brown, stratified sandy loam and coarse sand. In places the surface layer is thinner and lighter in color. In some areas part of the underlying material is calcareous loam till. In other areas the subsoil contains more sand.

Included with this soil in mapping are small areas of the well drained Camden soils, the poorly drained Drummer and Thorp soils, and the moderately well drained Proctor soils. Camden and Proctor soils are on slight rises above the Millbrook soil. Drummer and Thorp soils are in drainageways and depressions below the Millbrook soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Millbrook soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from strongly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In areas used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Harvesting or grazing when the soil is too wet and overgrazing, however, reduce forage production and cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture and the soil in good condition. Unmowed strips, 30 to 50 feet wide, at the edge of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered, however, by installing foundation drains. If the soil is used as a septic tank absorption field, the seasonal high water table and the moderate permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability class is I.

221B—Parr silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges and knolls on till plains and moraines. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 21 inches thick. The upper part is brown and light olive brown, firm clay loam, and the lower part is light olive brown, friable loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam. In places the surface layer is lighter in color. In some areas the subsoil contains more clay and less sand. In other areas the underlying material is brown, stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Odell and Raub soils. These soils are in drainageways or on slopes below the Parr soil They make up 2 to 8 percent of the unit.

Water and air move through the Parr soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from slightly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. In areas where the plow layer contains subsoil material, the surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, dwellings with basements, and lawns and landscaping. It is moderately well suited to dwellings without basements and to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. Returning crop residue to the soil helps to maintain tilth and fertility.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the

Figure 10.—Terraces and grassed waterways on Parr silt loam, 5 to 10 percent slopes, eroded.

structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the moderate permeability is a limitation. Enlarging the absorption area, however, helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

221C2—Parr silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on knolls and short, uneven side slopes on moraines and till plains. Individual areas are irregular in shape and range from 2 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 18 inches thick. The upper part is brown and light olive brown, firm clay loam, and the lower part is light olive brown, friable loam. The underlying material to a depth of 60 inches is light olive brown, calcareous loam. In places the surface layer is thinner and lighter in color. In some areas the subsoil is thinner. In other areas the underlying material is brown, stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Flanagan and Raub soils. These soils are in drainageways and on slopes below the Parr soil. They make up 2 to 12 percent of the unit.

Water and air move through the Parr soil at a moderate rate. Surface runoff is rapid in cultivated areas. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, and dwellings with basements. It is moderately well suited to dwellings without basements and to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation in which forage crops are grown for 1 year or more, a system of

conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these can keep soil loss at an acceptable level and thus maintain the productivity of the soil (fig. 10).

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the moderate permeability is a limitation. Enlarging the absorption area, however, helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe.

221D3—Parr clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes on moraines. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown clay loam about 4 inches thick. The subsoil is brown and light olive brown, firm clay loam about 16 inches thick. The underlying material to a depth of 60 inches is light olive brown, calcareous loam. In some areas the surface layer is lighter in color. In other areas the underlying material is brown, stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Flanagan soils. These soils are in drainageways and on slopes below the Parr soil. They make up 2 to 10 percent of the unit.

Water and air move through the Parr soil at a moderate rate. Surface runoff is rapid in cultivated areas. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is poorly suited to cultivated crops. It is moderately well suited to pasture and hay, habitat for openland wildlife, dwellings, local roads and streets, and septic tank absorption fields.

If this soil is used for corn or soybeans, further erosion is a hazard. A crop rotation that includes a forage crop and a combination of contour farming and no-tillage planting help to keep soil loss at an acceptable level and thus maintain the productivity of the soil. Terraces also help to control erosion. Returning crop residue to the soil helps to maintain tilth and fertility.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff and erosion.

If this soil is used as a site for dwellings, the slope is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Cutting and filling help to overcome the slope. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the slope and the moderate permeability are limitations. Installing the filter lines on the contour helps to overcome the slope. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capablity subclass is IVe.

223B2—Varna silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on knolls and ridgetops on till plains and moraines. Individual areas are irregular in shape and range from 2 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 7 inches thick. The subsurface layer is very dark gray, friable silty clay loam about 4 inches thick. The subsoil is about 29 inches thick. The upper part is brown and olive brown, firm silty clay, and the lower part is olive brown and olive, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is olive gray, mottled, calcareous silty clay loam. In places the surface soil is thinner and lighter in color. In some areas the subsoil is yellowish brown, friable loam or clay loam. In other areas the underlying material is grayish brown, mottled, calcareous silty clay.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the somewhat poorly drained Elliott soils. These soils are on toe slopes and in drainageways below the Varna soil. They make up 2 to 10 percent of the unit.

Water and air move through the Varna soil at a slow or moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to moderately alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited

to septic tank absorption fields and local roads and streets.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, or terraces.

If this soil is used as a site for dwellings with basements, the seasonal high water table is a limitation. It can be lowered, however, by installing tile lines around the base of foundations. If the soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table and the slow or moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

223C3—Varna silty clay loam, 5 to 12 percent slopes, severely eroded. This sloping, moderately well drained soil is on knolls and short, uneven side slopes on till plains and moraines. Individual areas are linear or oval and range from 2 to 70 acres in size.

Typically, the surface layer is mixed very dark grayish brown and yellowish brown, firm silty clay loam about 8 inches thick. The subsoil is about 16 inches thick. The upper part is brown and olive brown, firm silty clay, and the lower part is olive brown and olive, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is olive gray, mottled, calcareous silty clay loam. In places the surface layer is light in color. In some areas the subsoil contains more sand and less clay. In other areas the underlying material is grayish brown, mottled, calcareous silty clay.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and the somewhat poorly drained Elliott soils. These soils are in drainageways and on slopes below the Varna soil. They make up 2 to 8 percent of the unit.

Water and air move through the Varna soil at a slow or moderately slow rate. Surface runoff is rapid in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content also is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer is cloddy if it has been plowed when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is poorly suited to cultivated crops, well suited to openland wildlife habitat, and moderately well suited to pasture and hay. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

If this soil is used for corn or soybeans, the hazard of further erosion is severe. A crop rotation in which forage crops are grown for 1 year or more, a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these can help to keep soil loss at an acceptable level and thus maintain the productivity of the soil. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff and erosion. If possible, the pasture should be tilled on the contour when a seedbed is prepared.

If this soil is used as a site for dwellings, the slope is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements and the seasonal high water table a limitation on sites for dwellings with basements. Cutting and filling help to overcome the slope. Reinforcing the foundations of dwellings without basements helps to prevent the structural damage caused by shrinking and swelling. Installing drainage tile around the base of the foundations of dwellings with basements helps to lower the water table.

If this soil is used as a septic tank absorption field, the seasonal high water table and the slow or moderately slow permeability are limitations. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IVe.

232—Ashkum silty clay loam. This nearly level, poorly drained soil is on upland flats and in drainageways on till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are irregular in shape and range from 2 to more than 1,000 acres in size.

Typically, the surface soil is black, firm silty clay loam about 17 inches thick. The subsoil is about 39 inches thick. It is firm and mottled. The upper part is dark grayish brown and dark gray silty clay, and the lower part is gray silty clay loam. The underlying material to a depth of 72 inches is mottled gray and yellowish brown silty clay loam. In some areas, the subsoil is thinner and the underlying material is closer to the surface. In other areas the underlying material is dark gray, stratified silty clay loam, silt loam, and loam. In a few places the surface soil is thicker.

Included with this soil in mapping are small areas of the somewhat poorly drained Elliott soils and the

moderately well drained Varna soils. These soils are on ridgetops and side slopes above the Ashkum soil. They make up 2 to 8 percent of the unit.

Water and air move through the Ashkum soil at a moderately slow rate. Surface runoff is slow to ponded in cultivated areas. A seasonal high water table ranges from 1.0 foot above the surface to 1.0 foot below during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from slightly acid to moderately alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The firm surface soil is compact and cloddy if it has been plowed when wet. The shrink-swell potential and the potential for frost action are high.

Most areas are cultivated. This soil is well suited to cultivated crops and is moderately well suited to pasture and hay and to openland wildlife habitat. It is poorly suited to dwellings, lawns and landscaping, local roads and streets, and septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard and the shrink-swell potential a limitation. The ponding can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the ponding is a hazard and the moderately slow permeability a limitation. A drainage system is needed. Also, providing as much as 2 feet of loamy fill material is beneficial because it increases the depth to the seasonal high water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIw.

233B—Birkbeck silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on broad upland ridgetops and on toe slopes on till plains. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 49 inches thick. The upper part is brown and dark yellowish brown, friable and firm silty clay loam; the next part is dark yellowish brown and yellowish brown, mottled, firm silty clay loam; and the lower part is mottled yellowish brown and pale brown, firm clay loam. The underlying material to a depth of 70 inches is mottled yellowish brown and pale brown, calcareous loam. In some areas the surface soil is darker. In a few places the subsoil is loamy within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Sabina and Sunbury soils. Drummer soils are in shallow depressions and drainageways below the Birkbeck soil. The nearly level Sabina and Sunbury soils also are lower on the landscape than the Birkbeck soil. Included soils make up 2 to 7 percent of the unit.

Water and air move through the Birkbeck soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table is a limitation if this soil is used as a septic tank absorption field. The septic system functions properly only if the water table is lowered or the distribution lines are installed closer to the surface than is typical.

The capability subclass is IIe.

234A—Sunbury silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on till plains. Individual areas are irregular in shape and range from 8 to 35 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 3 inches thick. The subsoil is about 48 inches thick. It is mottled. The upper part is brown and dark yellowish brown, friable silty clay loam; the next part is yellowish brown and brown, firm and friable silty clay loam; and the lower part is light olive brown, friable and firm clay loam. The underlying material to a depth of 65 inches is

light olive brown and gray, mottled, calcareous loam. In places the surface soil is thicker and darker. In some areas the underlying material is stratified loam and sandy loam. In other areas the subsoil is thinner.

Included with this soil in mapping are small areas of the moderately well drained Birkbeck and Catlin soils and the poorly drained Drummer soils. Birkbeck and Catlin soils are on slight rises above the Sunbury soil, and Drummer soils are in drainageways below the Sunbury soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Sunbury soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to habitat for openland and woodland wildlife. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In the areas used for corn, soybeans, or small grain, keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. Underground drains help to lower the water table. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

The capability class is I.

235—Bryce silty clay. This nearly level, poorly drained soil is on upland flats and in drainageways on till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are irregular in shape and range from 2 to more than 100 acres in size.

Typically, the surface soil is black and very dark gray, firm silty clay about 14 inches thick. The subsoil is very firm, mottled silty clay about 36 inches thick. The underlying material to a depth of 60 inches is mottled gray and olive, calcareous silty clay. In places, the subsoil is thicker and the depth to calcareous silty clay is greater. In some areas the underlying material is gray, stratified loam and sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount, Elliott, and Swygert soils. These soils are on slight rises above the Bryce soil. They make up 2 to 5 percent of the unit.

Water and air move through the Bryce soil at a slow rate. Surface runoff is slow to ponded in cultivated areas. A seasonal high water table ranges from 1.0 foot above the surface to 1.0 foot below during the spring. Available water capacity is moderate. Organic matter content is high. Reaction is neutral to mildly alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The surface soil is in poor tilth and is compact and cloddy if it has been plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and is moderately well suited to pasture and hay and to openland wildlife habitat. Because it is subject to ponding, it is poorly suited to local roads and streets and to dwellings and generally is unsuited to septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay can be grown on this soil. Surface inlet tile lines or shallow ditches help to remove ponded water. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture and the soil in good condition.

If this soil is used as a site for dwellings, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. The ponding can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. A drainage system helps to establish lawns and ornamental trees and shrubs.

The capability subclass is IIw.

236A—Sabina silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on till plains. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface soil is dark grayish brown, friable silt loam about 13 inches thick. The subsoil is about 37 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the next part is mottled yellowish brown, brown, and grayish brown, firm and friable silty clay loam; and the lower part is light olive brown, mottled, friable loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam. In places the surface layer is darker. In some areas the underlying material is stratified loam and sandy loam. In other areas the subsoil is thinner.

Included with this soil in mapping are small areas of the moderately well drained Birkbeck and Xenia soils on the higher lying slight rises and the poorly drained Drummer soils in the lower lying shallow depressions and drainageways. These soils make up 5 to 15 percent of the unit.

Water and air move through the Sabina soil at a moderately slow rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction is dominantly medium acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to habitat for openland and woodland wildlife. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Underground drains help to lower the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIw.

241D—Chatsworth silty clay, 7 to 15 percent slopes. This strongly sloping, moderately well drained soil is on knolls and short, uneven side slopes on glacial moraines. Individual areas are round or oblong and range from 5 to 15 acres in size.

Typically, the surface layer is dark grayish brown, firm silty clay about 8 inches thick. The subsoil is mottled olive gray and olive, very firm silty clay about 11 inches thick. The underlying material to a depth of 60 inches is mottled gray, olive gray, and olive, calcareous silty clay. In some areas the surface layer is thicker and darker. In other areas the slope is less than 7 percent.

Included with this soil is mapping are small areas of the poorly drained Biyce soils and the somewhat poorly drained Swygert soils. These soils are in shallow depressions and drainageways below the Chatsworth soil. They make up 1 to 7 percent of the unit.

Water and air move through the Chatsworth soil at a very slow rate. Surface runoff is rapid in cultivated areas. Available water capacity is low. Organic matter content also is low. The surface layer and subsoil are mildly alkaline or moderately alkaline. The root zone is limited. The surface layer is in poor tilth and is compact and cloddy if it has been plowed when wet (fig. 11). The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is moderately well suited to pasture and hay and to openland wildlife habitat. It generally is unsuited to cultivated crops and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, the pasture should be tilled on the contour when a seedbed is prepared.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope.

If this soil is used as a septic tank absorption field, the slope and the very slow permeability are limitations. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. Installing the filter lines on the contour helps to overcome the slope.

The capability subclass is VIIe.

242A—Kendall silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on outwash plains adjacent to the major streams. Individual areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The subsurface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 32 inches thick. It is friable. The upper part is yellowish brown, mottled silty clay loam; the next part is mottled gray and yellowish brown silty clay loam; and the lower part is gray, mottled loam. The underlying material to a depth of 60 inches is mottled gray and strong brown, stratified sandy loam, loam, and silt loam. In places the surface layer is thicker and darker. In a few areas the underlying material is calcareous loam glacial till. In other areas the subsoil is thinner.

Included with this soil in mapping are small areas of the well drained Camden and moderately well drained St. Charles soils on the slightly higher rises and the poorly drained Drummer soils in the lower lying shallow

Figure 11.—Surface crusting on Chatsworth silty clay, 7 to 15 percent slopes.

depressions and drainageways. These soils make up 2 to 10 percent of the unit.

Water and air move through the Kendall soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to slightly acid in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to habitat for openland and woodland wildlife. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Overgrazing or grazing when the soil is too wet, however, reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture and the soil in good condition.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings. Underground drains help to lower the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

The capability subclass is IIw.

243B—St. Charles silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on upland ridges and on slight rises on outwash plains. Individual areas are irregular in shape and range from 10 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 2 inches thick. The subsoil is about 45 inches thick. The upper part is brown

and dark yellowish brown, friable and firm silty clay loam; the next part is dark yellowish brown and yellowish brown, mottled, firm and friable silty clay loam and silt loam; and the lower part is yellowish brown, mottled silt loam stratified with sandy loam. The underlying material to a depth of 60 inches is yellowish brown loam. In a few places the surface layer is thicker and darker. In some areas the underlying material is calcareous loam till. In other areas the loamy outwash material is closer to the surface.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Kendall soils. These soils are in shallow depressions and drainageways below the St. Charles soil. They make up 3 to 12 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal water table is 3.0 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table is a limitation. The septic system functions properly only if the water table is lowered or the distribution lines are installed closer to the surface than is typical.

The capability subclass is IIe.

291B—Xenia silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops and toe slopes on till plains. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 47 inches thick. The upper part is brown, friable silt loam; the next part is brown and dark yellowish brown, mottled, friable and firm silty clay loam; and the lower part is mottled brown and light olive brown, firm clay loam and loam. The underlying material to a depth of 72 inches is light olive brown, calcareous loam. In some areas the surface layer is thicker and lighter in color. In other areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Sabina and Sunbury soils. These soils are in slight depressions and drainageways below the Xenia soil. They make up 2 to 9 percent of the unit.

Water and air move through the Xenia soil at a moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 2.0 to 6.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to mildly alkaline in the subsoil and varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and lawns and landscaping. It is moderately well suited to dwellings without basements and is poorly suited to dwellings with basements and to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water intake.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely

deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing tile drains around foundations helps to lower the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

302—Ambraw silty clay loam. This nearly level, poorly drained soil is on low stream terraces and flood plains. It is occasionally flooded for brief periods from March to May. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer is black, friable loam about 7 inches thick. The subsoil is very dark gray, dark gray, and gray, mottled, friable loam about 25 inches thick. The underlying material to a depth of 60 inches is gray, mottled, stratified loam, clay loam, loamy sand, and sand. In a few areas the subsoil contains more clay. In other areas it contains less sand. In places the surface soil is thicker.

Included with this soil in mapping are small areas of the well drained Ross soils. These soils are on slight rises above the Ambraw soil. They make up 2 to 8 percent of the unit.

Water and air move through the Ambraw soil at a moderately slow or moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is within a depth of 2.0 feet during the spring. Available water capacity is moderate. Organic matter content also is moderate. The surface soil and subsoil are slightly acid or neutral. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to wetland wildlife habitat and is moderately well suited to cultivated crops and to pasture and hay. Because it is subject to flooding, it is poorly suited to local roads and streets and generally is unsuited to dwellings and septic tank absorption fields.

The areas used for corn, soybeans, or small grain are adequately protected from flooding. Tile drains and surface drains help to prevent excessive wetness. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

This soil provides good habitat for wetland wildlife. In most areas it is on both sides of perennial streams, which provide habitat for game fish. Shallow water areas are available. Also available are grain and seed crops, wild herbaceous plants, wetland plants, and other important habitat elements.

The capability subclass is IIw.

322C2—Russell silt loam, 4 to 11 percent slopes, eroded. This sloping, well drained soil is on short, uneven side slopes on till plains. Individual areas are irregular in shape and range from 3 to 75 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, friable silty clay loam; the next part is yellowish brown, mottled, friable silty clay loam; and the lower part is mottled light olive brown and olive, firm clay loam. The underlying material to a depth of 72 inches is mottled light olive brown and olive, calcareous loam. In some areas, the subsoil is thinner and the underlying material is closer to the surface. In other areas the upper part of the subsoil contains more sand. In a few places the surface soil is darker.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Sabina and Sunbury soils. These soils are in depressions and drainageways and on slopes below the Russell soil. They make up 2 to 10 percent of the unit.

Water and air move through the Russell soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from very strongly acid to neutral in the subsoil and varies in the surface layer as a result of local liming practices. The surface layer tends to crust after hard rains in areas where it contains subsoil material. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and lawns and landscaping. It is moderately well suited to dwellings and septic tank absorption fields and is poorly suited to local roads and streets.

In the areas used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation in which forage crops are grown for 1 year or more, a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these can help to keep soil loss at an acceptable level and thus maintain the productivity of the soil.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to

keep the pasture in good condition and to help control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the moderate permeability is a limitation. Enlarging the absorption area, however, helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe.

330—Peotone silty clay loam. This nearly level, very poorly drained soil is in shallow depressions in outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are round or oval (fig. 12) and range from 2 to 80 acres in size.

Typically, the surface layer is black, firm silty clay loam about 10 inches thick. The subsurface layer is black and very dark gray, very firm and firm silty clay loam about 22 inches thick. The subsoil is dark gray and gray, mottled, firm silty clay loam about 28 inches thick. The underlying material to a depth of 70 inches is gray, mottled silty clay loam. In places the surface soil is thinner. In some areas the surface soil and subsoil contain less clay. In other areas the underlying material is coprogenous earth.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton, Elburn, Elliott, Flanagan, and Raub soils, the well drained Parr soils, and the moderately well drained Varna soils. These soils are on slight rises and side slopes above the Peotone soil. They make up 2 to 10 percent of the unit.

Water and air move through the Peotone soil at a moderately slow rate. Surface runoff is very slow or ponded in cultivated areas. A seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during the spring. Available water capacity is high. Organic matter content also is high. Reaction ranges from slightly acid to moderately alkaline in the subsoil and varies in the surface layer as a result of local liming practices. The firm surface layer is compact and cloddy if

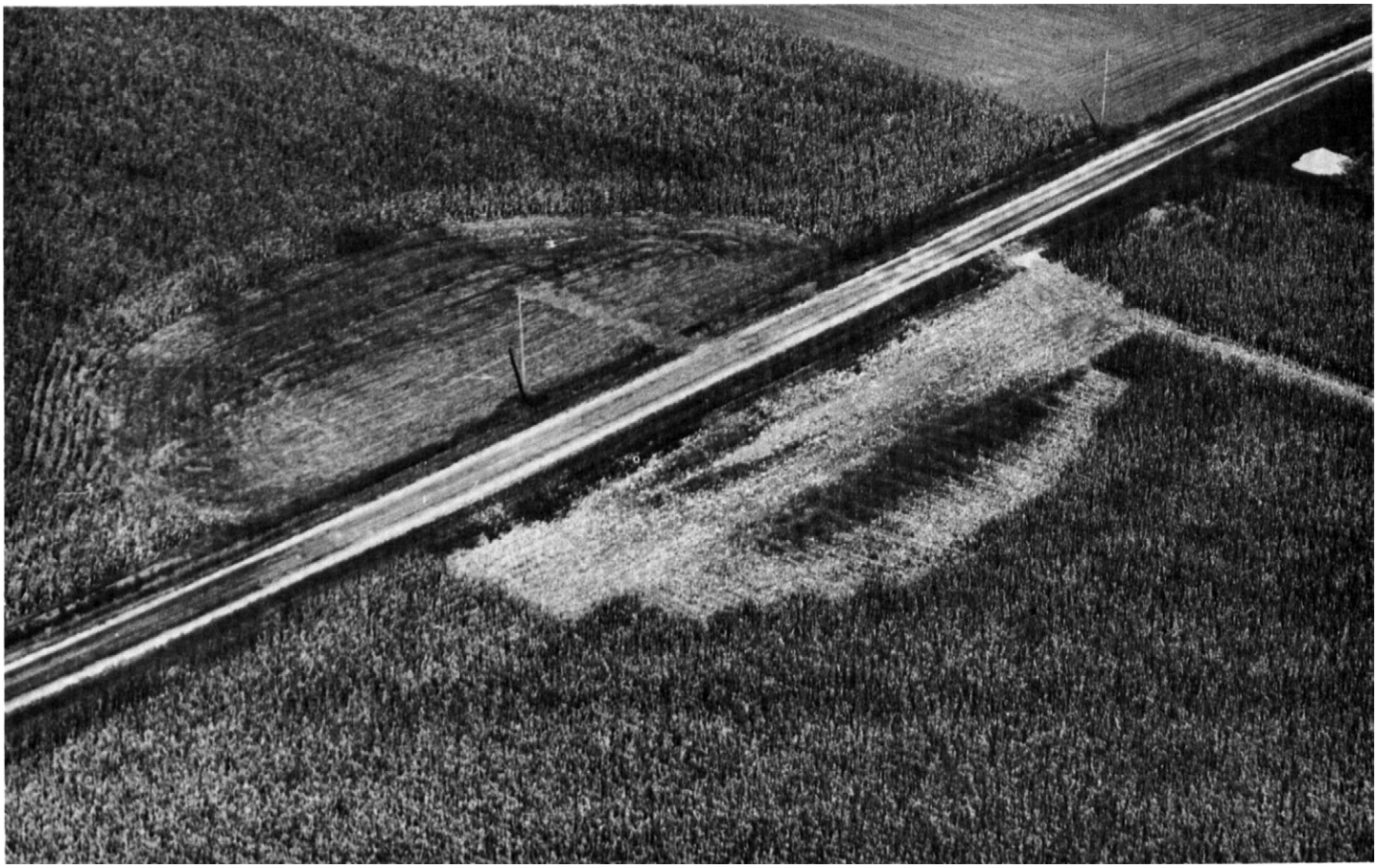

Figure 12.—An area of Peotone silty clay loam in a round depression.

it has been plowed when too wet. The potential for frost action and the shrink-swell potential are high.

Most areas are cultivated. This soil is well suited to cultivated crops in drained areas and to wetland wildlife habitat in undrained areas. It is moderately well suited to pasture and hay. Because it is subject to ponding, it is poorly suited to dwellings and local roads and streets and generally is unsuited to septic tank absorption fields.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Land grading also helps to control the ponding. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

In the areas used for pasture and hay, the ponding is a hazard. It can be controlled, however, by surface inlet tile drains or shallow ditches. Restricted use during wet periods helps to keep the pasture and the soil in good condition.

If this soil is used as a site for dwellings, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. The ponding can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. A drainage system helps to establish lawns and ornamental trees and shrubs.

The capability subclass is IIw.

387B—Ockley silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is dark yellowish brown, firm clay loam; and the lower part is mottled brown and dark yellowish brown, friable gravelly clay loam. The underlying material to a depth of 60 inches is brown, calcareous gravelly loamy sand and sand and gravel. In places the depth to the underlying sand and gravel is less than 40 inches. In some areas the underlying material is brown, stratified loam, clay loam, and sand. In a few areas the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount soils. These soils are on slight rises above the Ockley soil. They make up 1 to 4 percent of the unit.

Water and air move through the subsoil of the Ockley soil at a moderate rate and through the underlying material at a very rapid rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content is moderately low. Reaction varies in the surface layer as a result of local liming practices. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, and septic tank absorption fields. It is moderately well suited to dwellings and local roads and streets. It is a probable source of sand and gravel.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, the pasture or hayland should be tilled on the contour when a seedbed is prepared.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent structural damage caused by shrinking and swelling.

The capability subclass is IIe.

387C3—Ockley clay loam, 5 to 12 percent slopes, severely eroded. This sloping, well drained soil is on the sides of stream terraces. Individual areas are linear and range from 2 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable clay loam about 6 inches thick. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is mottled brown and dark yellowish brown, friable gravelly clay loam. The underlying material to a depth of 60 inches is brown, calcareous gravelly loamy sand and sand and gravel. In places the surface layer is thinner and contains more clay. In some areas the underlying sand and gravel is closer to the surface. In a few areas the underlying material is grayish brown, calcareous silty clay loam till.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils are on alluvial bottom land below the Ockley soil. They make up 0 to 6 percent of the unit.

Water and air move through the subsoil of the Ockley soil at a moderate rate and through the underlying material at a very rapid rate. Surface runoff is rapid in cultivated areas. Available water capacity is moderate. Organic matter content is low. The surface layer is medium acid or slightly acid. The potential for frost action and the shrink-swell potential are moderate.

Most areas are pastured or wooded. This soil is well suited to habitat for openland and woodland wildlife and is moderately well suited to pasture and hay and to dwellings and local roads and streets. It is poorly suited

to septic tank absorption fields and cultivated crops. It is a probable source of sand and gravel (fig. 13).

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

This soil provides good habitat for woodland wildlife. Measures that exclude livestock help to prevent the depletion of the shrubs and sprouts that provide food and cover for deer, squirrels, a variety of songbirds, and other kinds of woodland wildlife. Hedges and rows of shrubs provide cover for doves and many songbirds. Planting suitable grasses and legumes, such as bromegrass, orchardgrass, and ladino, alsike, or red clover, in open areas and at the border of wooded areas improves the habitat for pheasants and many other kinds of openland wildlife.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Cutting and filling help to overcome the slope. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the slope is a limitation. It can be overcome, however, by installing the filter lines on the contour.

The capability subclass is IVe.

398A—Wea silt loam, 0 to 3 percent slopes. This nearly level, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 2 to 300 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 15 inches thick. The subsoil is about 47 inches thick. The upper part is dark brown and dark yellowish brown, friable and firm silty clay loam; the next part is dark yellowish brown, firm clay loam; and the lower part is dark yellowish brown, friable gravelly loam. The underlying material to a depth of 70 inches is dark yellowish brown, calcareous coarse sand and gravel. In places the surface layer is thinner and lighter in color. In some areas the underlying material is dark yellowish brown, stratified loam, sandy loam, and sand. In other areas the subsoil is thinner.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and La Hogue soils and the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Wea soil. They make up 2 to 5 percent of the unit.

Water and air move through the subsoil of the Wea soil at a moderate rate. Surface runoff is slow in cultivated areas. Available water capacity is high. Organic matter content also is high. Reaction ranges from medium acid to neutral in the subsoil and varies in the surface soil as a result of local liming practices. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, lawns and landscaping, and septic tank absorption fields. It is moderately well suited to dwellings and local roads and streets. It is a probable source of sand and gravel.

Few limitations affect the use of this soil for corn, soybeans, or small grain. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

The capability class is I.

402—Colo silty clay loam. This nearly level, poorly drained soil is on bottom land adjacent to streams. It is occasionally flooded for brief periods from March to June. Individual areas are irregular in shape and range from 10 to more than 300 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam about 9 inches thick. The subsurface layer is black and very dark gray, mottled, friable silty clay loam about 29 inches thick. The subsoil is very dark gray, mottled, friable silty clay loam about 12 inches thick. The underlying material to a depth of 68 inches is mottled dark grayish brown and gray clay loam. In some areas the surface soil is thinner. In other areas it is loam or clay loam. In places overwash of dark grayish brown, friable silt loam or silty clay loam is at the surface.

Included with this soil in mapping are small areas of the well drained Alvin and Ross soils. These soils are on slight rises above the Colo soil. They make up 2 to 10 percent of the unit.

Water and air move through the Colo soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is within a depth of 2.0 feet during the spring. Available water capacity is high. Organic matter content also is high. Reaction is slightly acid or neutral in the subsoil and varies in the surface layer as a result of local liming practices. The shrink-swell potential and the potential for frost action are high.

Most areas are cultivated. This soil is well suited to wetland wildlife habitat and is moderately well suited to cultivated crops and to pasture or hay. Because it is subject to flooding, it is poorly suited to local roads and streets and generally is unsuited to dwellings and septic tank absorption fields.

The areas used for corn, soybeans, or small grain are adequately protected from flooding. Tile drains and surface drains help to prevent excessive wetness. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

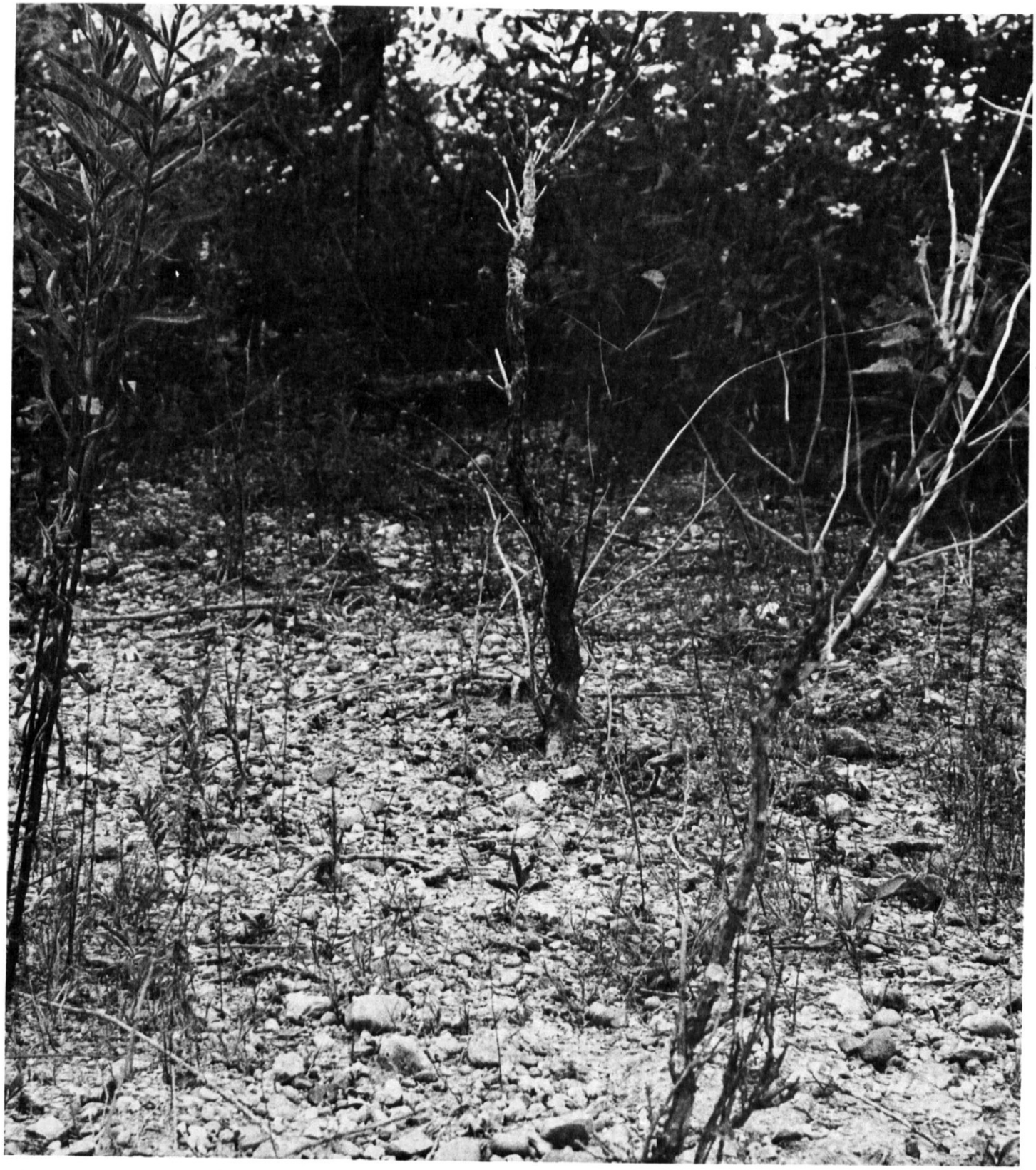

Figure 13.—An area of Ockley clay loam, 5 to 12 percent slopes, severely eroded. This soil is a source of sand and gravel.

If this soil is used for pasture and hay, a drainage system and measures that control flooding are needed. Overgrazing reduces forage yields and causes surface compaction and poor tilth. Restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil provides good habitat for wetland wildlife. In most areas it is on both sides of the major streams, which provide habitat for game fish. Shallow water areas are available. Also available are grain and seed crops, wild herbaceous plants, wetland plants, and other important habitat elements.

The capability subclass is IIw.

440B—Jasper loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on toe slopes and ridges on till uplands, outwash plains, and stream terraces. Individual areas are irregular in shape and range from 2 to 90 acres in size.

Typically, the surface soil is very dark gray and dark brown, friable loam about 12 inches thick. The upper part is dark yellowish brown, firm clay loam; the next part is yellowish brown, friable sandy clay loam; and the lower part is brown, mottled, friable sandy loam. The underlying material to a depth of 60 inches is mottled brown and gray, stratified loam, sandy loam, and silt loam. In places the surface soil is thinner and lighter in color. In some areas the subsoil contains less sand and more silt. In other areas the underlying material is calcareous loam or silty clay loam glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and La Hogue soils and the poorly drained Drummer soils. These soils are in small depressions and drainageways below the Jasper soil. They make up 2 to 7 percent of the unit.

Water and air move through the Jasper soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderate. Reaction is slightly acid or medium acid in the subsoil and varies in the surface soil as a result of local liming practices. The potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, dwellings, lawns and landscaping, septic tank absorption fields, and most recreational uses. It is moderately well suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings or septic tank absorption fields, surface mulch is needed to control erosion during construction. If the soil is used as a site for local roads and streets, low strength and the potential for frost action are limitations. Providing suitable subgrade material, however, helps to overcome these limitations.

The capability subclass is IIe.

440C2—Jasper loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on knolls and short, uneven side slopes on stream terraces and outwash plains. Individual areas are irregular in shape and range from 2 to 75 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 10 inches thick. The subsoil is about 22 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is mottled brown and yellowish brown, friable sandy clay loam and sandy loam. The underlying material to a depth of 60 inches is mottled brown and gray, stratified loam, sandy loam, and silt loam. In places the surface layer is thinner and, if plowed, contains subsoil material. In some areas the subsoil contains less sand. In other areas the underlying material is calcareous loam glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and La Hogue soils and the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Jasper soil. They make up 3 to 9 percent of the unit.

Water and air move through the Jasper soil at a moderate rate. Surface runoff is rapid in cultivated areas. Available water capacity is high. Organic matter content is moderate. Reaction ranges from strongly acid to slightly acid in the subsoil and varies in the surface layer as a result of local liming practices. The potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, lawns and landscaping, dwellings, and septic tank absorption fields. It is moderately well suited to local roads and streets.

In the areas used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation in which forage crops are grown for 1 year or more, a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these can keep soil loss at an acceptable level and thus maintain the productivity of the soil.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings or septic tank absorption fields, erosion is a hazard during construction. It can be controlled, however, by surface mulch.

The capability subclass is IIIe.

448B—Mona silt loam, 2 to 7 percent slopes. This gently sloping, moderately well drained soil is on upland ridges and knolls. Individual areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface soil is very dark grayish brown and dark brown, friable silt loam about 15 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown, friable silty clay loam; the next part is dark yellowish brown, mottled, friable clay loam and sandy clay loam; and the lower part is light olive brown, firm silty clay. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous silty clay. In some plowed areas the surface soil contains subsoil material. In other areas the surface soil and subsoil contain more clay and less sand. In a few areas the underlying material is brown, stratified, loamy outwash.

Included with this soil in mapping are small areas of the poorly drained Bryce soils and the somewhat poorly drained Swygert soils. These soils are on toe slopes and in drainageways below the Mona soil. They make up 5 to 15 percent of the unit.

Water and air move through the Mona soil at a moderately slow rate. Surface runoff is medium in cultivated areas. A perched seasonal high water table is 2.5 to 4.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to moderately alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is well suited to cultivated crops and to pasture and hay, openland wildlife habitat, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains around the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a septic tank absorption field, the moderately slow permeability and the seasonal high water table are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe.

481A—Raub silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slight rises on till plains and on toe slopes of terminal moraines. Individual areas are irregular in shape and range from 2 to 300 acres in size.

Typically, the surface soil is black and very dark grayish brown, friable silt loam about 18 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and mottled. The upper part is friable and firm silty clay loam, and the lower part is firm clay loam. The underlying material to a depth of 60 inches is mottled yellowish brown and gray, calcareous loam. In places the surface layer is thinner and lighter in color. In some areas the upper part of the subsoil contains more sand. In other areas part of the underlying material is brown, stratified loam, sandy loam, and sand.

Included with this soil in mapping are small areas of the moderately well drained Dana soils, the poorly drained Drummer soils, and the well drained Parr soils. Dana and Parr soils are on ridges and side slopes above the Raub soil, and Drummer soils are in depressions and drainageways below the Raub soil. Included soils make up 2 to 6 percent of the unit.

Water and air move through the Raub soil at a moderately slow rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to mildly alkaline in the subsoil and varies in the surface soil as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Because a drainage system has been installed, this soil is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Installing drainage tile around foundations helps to lower the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to

lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

Low strength, the seasonal high water table, the potential for frost action, and the shrink-swell potential are limitations if this soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, shrinking and swelling, and frost action. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by wetness and frost action.

The capability class is I.

490A—Odell silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on slightly convex rises on till plains. Individual areas are oval or irregularly shaped and range from 2 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 11 inches thick. The subsoil is about 15 inches thick. It is friable and mottled. The upper part is brown silty clay loam, and the lower part is light olive brown clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam. In some areas, the subsoil contains less sand and the depth to calcareous loam is more than 40 inches. In other areas the underlying material is stratified loam, sandy loam, loamy sand, and sand.

Included with this soil in mapping are small areas of the moderately well drained Dana soils, the poorly drained Drummer soils, and the well drained Parr soils. Dana and Parr soils are higher on the landscape than the Odell soil, and Drummer soils are in shallow depressions and drainageways below the Odell soil. Included soils make up 2 to 13 percent of the unit.

Water and air move through the Odell soil at a moderately slow rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1.0 to 3.0 feet below the surface during the spring. Available water capacity is moderate. Organic matter content is high. Reaction varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, to pasture and hay, and to openland wildlife habitat. It is moderately well suited to lawns and landscaping and is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

In the areas used for corn, soybeans, or small grain, a drainage system may be needed to improve productivity. Tile drains function satisfactorily if suitable outlets are available. Returning crop residue to the soil and keeping tillage at a minimum help to maintain fertility and tilth and help to prevent surface crusting.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Installing tile drains around the base of foundations helps to lower the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Installing a drainage system helps to establish lawns and ornamental trees and shrubs.

If this soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability class is I.

533—Urban land. This map unit occurs as areas covered by pavement and buildings. Because of extensive land smoothing, it generally is nearly level and gently sloping. All of the areas are in downtown Rantoul, Urbana, and Champaign. They commonly are square or rectangular, but some are long and narrow. Typically, they are 40 to 300 acres in size.

More than 85 percent of this map unit is covered by buildings and pavement. Most of the paved areas are parking lots adjacent to shopping centers, industrial plants, and other commercial buildings. The soils have been so extensively modified by cutting and filling that they cannot be identified.

Included with this map unit in mapping are small areas of Drummer and Flanagan soils and of Orthents, loamy. The poorly drained Drummer and somewhat poorly drained Flanagan soils are in slight depressions and drainageways. The Orthents are moderately fine textured to moderately coarse textured soils that have been modified by urban development. Included soils make up less than 15 percent of the unit.

Runoff generally is very rapid on the Urban land. Because of the design of most paved areas, the water commonly is diverted to storm drainage systems. In some areas, however, it is diverted to adjacent soils. The additional runoff causes erosion on these soils. Also, it aggravates flooding.

The vegetation is mainly grasses at the border of the urban areas and widely spaced trees and shrubs. Weeds and grasses grow in a few idle areas at the edge of built-up land. Special management is needed when trees and shrubs are planted and after they are established. Periodic supplemental watering is needed in some areas. Red maple, silver maple, hackberry, green ash, and sycamore can be planted along streets.

This map unit is not assigned to a capability class or subclass.

570B—Martinsville silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces and outwash plains. Individual areas are irregularly shaped or oblong and range from 5 to 35 acres in size.

Typically, the surface layer is mixed dark grayish brown and yellowish brown, friable silt loam about 6

inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 41 inches thick. It is friable. The upper part is yellowish brown silty clay loam; the next part is dark yellowish brown clay loam and sandy clay loam; and the lower part is yellowish brown, stratified silt loam and loam. The underlying material to a depth of 72 inches is mottled yellowish brown and dark grayish brown, stratified silt loam, loam, and sandy clay loam. In places the surface layer is darker. In some areas the underlying material is calcareous loam till. In other areas the middle part of the subsoil contains less sand and more silt.

Included with this soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Kendall soils. These soils are in shallow depressions and drainageways below the Martinsville soil. They make up 2 to 10 percent of the unit.

Water and air move through the Martinsville soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to mildly alkaline in the subsoil and from medium acid to neutral in the surface layer. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used for pasture or hay. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, lawns and landscaping, and septic tank absorption fields. It is moderately well suited to dwellings and is poorly suited to local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these.

Pasture plants and hay grow well on this soil. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

The capability subclass is IIe.

570C2—Martinsville loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on short, uneven side slopes on stream terraces. Individual areas are irregularly shaped or oblong and range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown and brown, friable loam about 10 inches thick. The subsoil is about 30 inches thick. It is friable. The upper part is dark yellowish brown clay loam and loam, and the lower part is brown sandy loam. The underlying material to a depth of 72 inches is mottled yellowish brown and dark grayish brown, stratified sandy loam, sandy clay loam, and silt loam. In some areas the underlying material is calcareous loam till, and in others it is calcareous sand and gravel. In a few places the subsoil contains less sand and more silt.

Included with this soil in mapping are small areas of the poorly drained Colo and Drummer soils and the somewhat poorly drained Kendall soils. These soils are lower on the landscape than the Martinsville soil. They make up 1 to 7 percent of the unit.

Water and air move through the Martinsville soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil and from medium acid to neutral in the surface layer. The surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas are wooded. This soil is well suited to cultivated crops and to pasture and hay, habitat for openland and woodland wildlife, septic tank absorption fields, and lawns and landscaping. It is moderately well suited to dwellings and is poorly suited to local roads and streets.

If this soil is used for pasture, timely deferment of grazing and pasture rotation are needed to prevent surface compaction and excessive runoff and erosion. If possible, the pasture or hayland should be tilled on the contour when a seedbed is prepared.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling.

The capability subclass is IIIe.

570D2—Martinsville loam, 10 to 18 percent slopes, eroded. This strongly sloping, well drained soil is on short, uneven side slopes on stream terraces. Individual areas are linear or oblong and range from 2 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. The subsoil is about 27 inches thick. It is friable. The upper part is dark yellowish brown clay loam, and the lower part is brown sandy loam and loam. The underlying material to a depth of 72 inches is brown, stratified silt loam, sandy clay loam, and loam. In some areas the underlying material is calcareous loam till, and in others it is calcareous sand and gravel. In a few places the subsoil contains more clay.

Included with this soil in mapping are small areas of the poorly drained Colo and Drummer soils. Colo soils are on alluvial bottom land, and Drummer soils are in drainageways. Both are lower on the landscape than the

Martinsville soil. Included soils make up 1 to 8 percent of the unit.

Water and air move through the Martinsville soil at a moderate rate. Surface runoff is rapid in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil and from medium acid to neutral in the surface layer. The shrink-swell potential and the potential for frost action are moderate.

Most areas are wooded. This soil is well suited to pasture and hay and to woodland wildlife habitat. It is moderately well suited to cultivated crops and to dwellings, septic tank absorption fields, and nature paths and trails and is poorly suited to local roads and streets.

This soil provides good habitat for woodland wildlife. Measures that exclude livestock help to prevent the depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

Nature paths and trails can be constructed in areas where the slope is less than 15 percent. In the steeper areas, either land leveling or stairways and handrails are needed. Erosion is the main hazard if the plant cover is removed, for example, during construction of the paths and trails.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Cutting and filling help to overcome the slope. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. If the soil is used as a septic tank absorption field, the slope is a limitation. It can be overcome, however, by installing the filter lines on the contour.

The capability subclass is IVe.

637—Muskego silty clay loam, overwash. This nearly level, very poorly drained soil is in shallow depressions in outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are round and range from 2 to 30 acres in size.

Typically, the surface soil is black, firm and friable silty clay loam about 16 inches thick. The subsurface and bottom tiers are mottled black and very dark grayish brown, friable muck about 34 inches thick. The underlying material to a depth of 70 inches is mottled black and olive gray, calcareous sedimentary peat. In some areas the surface soil is thicker. In other areas the underlying material is stratified loam and sandy loam or calcareous silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Ashkum soils and small areas of Peotone soils, which have a fine textured mineral subsoil. Both of the included soils are in positions on the landscape similar to those of the Muskego soil. They make up 1 to 5 percent of the unit.

Water and air move through the upper part of the Muskego soil at a moderate or moderately rapid rate and through the underlying material at a slow rate. Surface runoff is very slow or ponded in cultivated areas. A seasonal high water table ranges from 1 foot above the surface to 1 foot below during the spring. Available water capacity is very high. Organic matter content also is very high. Reaction varies in the surface soil as a result of local liming practices. The potential for frost action and the shrink-swell potential are high. The soil is unstable. It is highly compressible when supporting loads and is subject to subsidence after it is drained.

Most areas are cultivated. This soil is well suited to wetland wildlife habitat and is moderately well suited to cultivated crops and to pasture and hay. Because it is subject to ponding, it is poorly suited to local roads and streets and generally is unsuited to dwellings and septic tank absorption fields.

Because a drainage system has been installed in many areas, this soil commonly is sufficiently drained for corn, soybeans, and small grain. Measures that maintain the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function so well, however, because the soil is subject to subsidence. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay can be grown on this soil. Overgrazing or grazing when the soil is too wet, however, reduces forage production and causes surface compaction and poor tilth. Proper stocking rates and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIIw.

802—Orthents, loamy. These moderately fine textured to moderately coarse textured, moderately well drained and somewhat poorly drained soils have been modified by filling and leveling. In most areas they are nearly level or gently sloping. In a few areas near interstate cloverleafs, however, they are sloping or strongly sloping. Individual areas are square, rectangular, or irregularly shaped and range from 10 to more than 200 acres in size.

A typical area is one where the loamy material has been deposited, removed, or shaped. Examples are cloverleafs on interstate highways, railroad beds, airports, and revegetated gravel pits and fill areas. Soil borings indicate that the soil material varies widely and does not occur in a consistent pattern.

Included with these soils in mapping are highway interchanges, gravel pits, and some urban areas where concrete, asphalt, buildings, streets, and parking lots cover as much as 65 percent of the surface.

Available water capacity varies but generally is moderate. Permeability also varies because the soils have been compacted by construction equipment and

Figure 14.—A severely eroded area of Orthents, loamy.

because the texture varies. The content of organic matter and plant nutrients generally is moderate.

Most areas are idle or are developed for residential or other nonfarm uses. Unless a good plant cover protects the surface, erosion is a severe hazard. It is especially severe in the more sloping areas, which are easily eroded (fig. 14). In severely eroded areas, special management is needed to establish and maintain a plant cover that controls runoff and erosion. The plant cover ranges from none in newly exposed areas to a good cover of sod in some developed areas. Onsite investigation is needed to determine the limitations or hazards affecting the development of specific areas for urban uses.

This map unit is not assigned to a capability class or subclass.

865—Pits, gravel. This map unit consists of excavations from which gravel and some sand have been removed. It generally is on outwash plains, on benches near streams, or on kames. The gravel is used mainly as roadfill or other construction material. Individual areas are square, rectangular, or irregularly shaped and range from 2 to 80 acres in size.

The excavations commonly are 10 to 50 feet deep. Many are filled with water and are described as water areas on the soil maps. The surrounding soil material generally was scraped or mixed when the sand and gravel were mined. It is mainly low in fertility and in organic matter content. Available water capacity varies.

Some abandoned pits can be filled with solid refuse and then covered with clean fill material. The fill should settle and be stable before it is graded. If reclaimed, some areas are suitable for recreational uses, such as hiking paths and trails and fishing areas, or for commercial and industrial uses. Topdressing generally is needed to establish vegetation. The feasibility of reclamation depends on the condition at the site and the proposed alternative use. Onsite investigation is needed to plan the development for a specific use.

This map unit is not assigned to a capability class or subclass.

2027C—Miami-Urban land complex, 2 to 10 percent slopes. This map unit occurs as areas of a sloping, well drained Miami soil intermingled with gently sloping areas of Urban land. Individual areas range from 5 to 70 acres in size. They are 50 to 80 percent Miami soil and 10 to 40 percent Urban land. The Miami soil and Urban land occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Miami soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 23 inches thick. The upper part is yellowish brown, friable silty clay loam; the next part is brown, firm clay loam; and the lower part is brown, friable loam. The underlying material to a depth of 60 inches is light olive brown and light yellowish brown, calcareous loam. Some of the low areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified.

Included with the Miami soil in mapping are small areas of the poorly drained Drummer soils and the somewhat poorly drained Sabina and Sunbury soils. Sabina and Sunbury soils are on convex slopes below the Miami soil. Drummer soils are in shallow depressions and drainageways below the Miami soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Runoff is medium. Available water capacity is high or moderate. Organic matter content is moderately low. Reaction ranges from medium acid to moderately alkaline in the subsoil and from medium acid to neutral in the surface layer. The potential for frost action and the shrink-swell potential are moderate.

The Miami soil, or open part of the map unit, is used for parks, paths and trails, lawns, and gardens. It is well suited to lawns, gardens, and ornamental trees and shrubs and to nature paths and trails. It is moderately well suited to dwellings, septic tank absorption fields, and local roads and streets.

In areas where the Miami soil is used for grasses, flowers, vegetables, shrubs, wild herbaceous plants, hardwood trees, and coniferous plants, measures that control the competing plants are needed.

If the Miami soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. Erosion and sedimentation are hazards during construction, especially if the surface is bare for a considerable period. If the soil is used as a septic tank absorption field, the moderately slow permeability is a limitation. Enlarging the absorption area, however, helps to overcome the slow absorption of liquid waste.

If the Miami soil is used as a site for local roads and streets, low strength and the potential for frost action are limitations. They can be overcome, however, by providing suitable subgrade material.

Few limitations affect the use of the Miami soil for paths and trails. If the soil is developed for other recreational uses, such as playgrounds and athletic fields, some land leveling is needed. Onsite investigation is needed to plan the development of specific sites.

This map unit is not assigned a capability class or subclass.

2152—Drummer-Urban land complex, 0 to 2 percent slopes. This nearly level map unit occurs as areas of a poorly drained Drummer soil intermingled with areas of Urban land. It is on smooth upland flats and in drainageways that are occasionally ponded for brief periods. Individual areas range from 2 to more than 640 acres in size. They are 45 to 60 percent Drummer soil and 25 to 40 percent Urban land. The Drummer soil and Urban land occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical area of the Drummer soil, the surface soil is black, firm silty clay loam about 14 inches thick. The subsoil is about 33 inches thick. The upper part is very dark gray, dark gray, grayish brown, and yellowish brown, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, friable loam. The underlying material to a depth of 60 inches is dark gray, mottled, stratified loam and sandy loam. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified.

Included with the Drummer soil in mapping are small areas of the somewhat poorly drained Elburn, Flanagan, and Raub soils and the moderately well drained Catlin and Dana soils. These soils are on knobs and rises above the Drummer soil. They make up 10 to 25 percent of the unit.

In most areas excess water is drained through storm sewers, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless drained, the Drummer soil has a seasonal high water table that ranges from 0.5 foot above the surface to 2.0 feet below during the spring.

Water and air move through the Drummer soil at a moderate rate. Available water capacity is high. Organic matter content also is high. Reaction is slightly acid or neutral in the surface layer and ranges from medium acid to moderately alkaline in the subsoil. The shrink-swell potential is moderate, and the potential for frost action is high.

The Drummer soil, or open part of the map unit, is used for parks, building site development, lawns, gardens, and golf courses. It is poorly suited to dwellings and local roads and streets and generally is unsuited to septic tank absorption fields. Because of the seasonal wetness, it is poorly suited to lawns, vegetable and flower gardens, ornamental trees and shrubs, and recreational uses. Lowering the water table with underground drains and installing surface drains help to overcome this limitation. Erosion is a hazard in areas where the surface is bare and in areas used as watercourses.

If the Drummer soil is used as a site for dwellings or septic tank absorption fields, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Measures that remove ponded water and lower the water table are needed on sites for dwellings. Reinforcing the foundations of dwellings without basements helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed in septic tank absorption fields. Also, providing as much as 2 feet of loamy material is beneficial because it increases the depth to the water table. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength, ponding, frost action, and shrinking and swelling are problems if the Drummer soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and frost action.

This map unit is not assigned to a capability class or subclass.

2154A—Flanagan-Urban land complex, 0 to 3 percent slopes. This nearly level map unit occurs as areas of a somewhat poorly drained Flanagan soil intermingled with areas of Urban land. It is on slight rises and ridges on till plains. Individual areas range from 10 to more than 600 acres in size. They are 40 to 55 percent Flanagan soil and 35 to 45 percent Urban land. The Flanagan soil and Urban land occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Flanagan soil has a surface layer of very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown and yellowish brown, mottled, firm silty clay loam, and the lower part is mottled yellowish brown, light olive brown, brown, and light brownish gray, friable silt loam. The underlying material to a depth of 60 inches is yellowish brown, mottled, calcareous loam. In some areas the surface layer is thinner and lighter in color. In other areas the underlying material is stratified loam, silt loam, and sandy loam. Some of the low areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Flanagan soil in mapping are small areas of Catlin, Dana, and Drummer soils. The moderately well drained Catlin and Dana soils are in convex areas above the Flanagan soil, and the poorly drained Drummer soils are in slight depressions and drainageways below the Flanagan soil. Included soils make up 15 to 25 percent of the unit.

In most areas excess water is drained through storm sewers, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless drained, the Flanagan soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

Water and air move through the Flanagan soil at a moderately slow rate. Surface runoff is slow. Available water capacity is high. Organic matter content also is high. Reaction is slightly acid or neutral in the surface layer and ranges from medium acid to mildly alkaline in the subsoil. The shrink-swell potential and the potential for frost action are high.

The Flanagan soil, or open part of the map unit, is used for parks, building sites, lawns, and gardens. It is moderately well suited to lawns and landscaping, vegetable and flower gardens, and ornamental trees and shrubs. It is poorly suited to recreational uses, dwellings, septic tank absorption fields, and local roads and streets. Erosion is a hazard on construction sites where the surface is bare and in areas used as watercourses.

If the Flanagan soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. A drainage system is needed to reduce the wetness around dwellings, on lawns, and around ornamental trees and shrubs. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

If the Flanagan soil is used as a septic tank absorption field, the seasonal high water table and the moderately slow permeability are limitations. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength, the potential for frost action, and the shrink-swell potential are limitations if the Flanagan soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help to prevent the damage caused by frost action.

This map unit is not assigned to a capability class or subclass.

2171B—Catlin-Urban land complex, 2 to 7 percent slopes. This gently sloping map unit occurs as areas of a moderately well drained Catlin soil intermingled with areas of Urban land. It is on upland ridges. Individual areas range from 5 to 250 acres in size. They are 40 to 55 percent Catlin soil and 35 to 45 percent Urban land. The Catlin soil and Urban land occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Catlin soil has a surface layer of very dark grayish brown, friable silt loam about 11 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, friable silty clay loam; the next part is dark yellowish brown, mottled, friable silty clay loam; and the lower part is light olive brown, mottled, firm clay loam. The underlying material to a depth of 70 inches is light olive brown, calcareous loam. In some areas the surface layer is thinner and lighter in color. In other areas the underlying material is noncalcareous, stratified outwash. In a few places calcareous loam till is within a depth of 40 inches. Small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Catlin soil in mapping are small areas of Drummer and Flanagan soils on the lower parts of the landscape. The poorly drained Drummer soils are in slight depressions and drainageways. The somewhat poorly drained Flanagan soils are on broad upland flats and toe slopes. Included soils make up 15 to 25 percent of the unit.

Water and air move through the Catlin soil at a moderate rate. A seasonal high water table is 3.5 to 6 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. Reaction is slightly acid to mildly alkaline in the surface layer and ranges from medium acid to neutral in the subsoil. The shrink-swell potential is moderate, and the potential for frost action is high.

The Catlin soil, or open part of the map unit, is used for parks, golf fairways, building sites, lawns, and gardens. It is well suited to lawns, vegetable and flower gardens, and ornamental trees and shrubs because the available water capacity is high and the surface layer is friable and can be easily tilled throughout a wide range in moisture content. The soil also is well suited to recreational uses. It is moderately well suited to dwellings and is poorly suited to septic tank absorption fields and local roads and streets. Erosion is a hazard in areas where the surface is bare for considerable periods and in areas used as watercourses.

If the Catlin soil is used as a site for dwellings, the shrink-swell potential is a limitation. Also, the seasonal high water table is a limitation on sites for dwellings with basements. It can be lowered, however, by installing tile drains at the base of foundations. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If the Catlin soil is used as a septic tank absorption field, the seasonal high water table is a limitation. It can be lowered, however, by installing underground drains. If this measure is not feasible, municipal sanitary treatment facilities should be used.

Low strength and the potential for frost action are limitations if the Catlin soil is used as a site for local roads and streets. Strengthening or replacing the subgrade material helps to prevent the damage caused by low strength and frost action. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help to prevent the damage caused by frost action.

This map unit is not assigned to a capability class or subclass.

2198A—Elburn-Urban land complex, 0 to 3 percent slopes. This nearly level map unit occurs as areas of a somewhat poorly drained Elburn soil intermingled with areas of Urban land. It is on slight rises on outwash plains. Individual areas range from 2 to more than 100 acres in size. They are 40 to 55 percent Elburn soil and 35 to 45 percent Urban land. The Elburn soil and Urban land occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Elburn soil has a surface layer of very dark gray, friable silt loam about 16 inches thick. The subsoil is about 41 inches thick. The upper part is mottled yellowish brown and grayish brown, firm and friable silty clay loam, and the lower part is light brownish gray, mottled, friable silt loam stratified with loam and sandy loam. The underlying material to a depth of 66 inches is mottled grayish brown and yellowish brown, stratified sandy loam and coarse sand. In a few places it is calcareous loam. Some of the low areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Elburn soil in mapping are small areas of the moderately well drained Catlin and Plano soils and the poorly drained Drummer soils. Catlin and Plano soils are higher on the landscape than the Elburn soil, and Drummer soils are in slight depressions and drainageways below the Elburn soil. Included soils make up 15 to 25 percent of the unit.

In most areas excess water is drained through sewer systems, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless drained, the Elburn soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

Water and air move through the Elburn soil at a moderate rate. Surface runoff is slow. Available water capacity is high. Organic matter content also is high. The surface layer and subsoil range from medium acid to mildly alkaline. The shrink-swell potential is moderate, and the potential for frost action is high.

The Elburn soil, or open part of the map unit, is used for parks, building sites, lawns, and gardens. It is well suited to vegetable and flower gardens and ornamental trees and shrubs and is moderately well suited to lawns and landscaping and to recreational uses. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If the Elburn soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed to reduce the wetness around dwellings, on lawns, and around ornamental trees and shrubs. Municipal treatment facilities should be used unless underground drains can adequately lower the water table in septic tank absorption fields.

Low strength and the potential for frost action are limitations if the Elburn soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and frost action. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help prevent the damage caused by frost action.

This map unit is not assigned to a capability class or subclass.

2236A—Sabina-Urban land complex, 0 to 3 percent slopes. This nearly level map unit occurs as areas of a somewhat poorly drained Sabina soil intermingled with areas of Urban land. It is on convex slopes on till plains. Individual areas range from 5 to 80 acres in size. They are 50 to 80 percent Sabina soil and 15 to 45 percent Urban land. The Sabina soil and Urban land occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical area of the Sabina soil, the surface soil is dark grayish brown, friable silt loam about 13 inches thick. The subsoil is about 37 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the next part is mottled yellowish brown, brown, and grayish brown, firm and friable silty clay loam; and the lower part is light olive brown, mottled, friable loam. The underlying material to a depth of 60 inches is light olive brown, mottled, calcareous loam. In a few places the surface soil is darker. In some areas the underlying material is stratified loam and sandy loam. Some of the low areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Sabina soil in mapping are small areas of the poorly drained Drummer soils and the moderately well drained Birkbeck and Xenia soils. Birkbeck and Xenia soils are on slight rises above the Sabina soil, and Drummer soils are in shallow depressions and drainageways below the Sabina soil. Included soils make up 5 to 15 percent of the unit.

In most areas excess water is drained through sewer systems, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless drained, the Sabina soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

Water and air move through the Sabina soil at a moderately slow rate. Surface runoff is slow. Available water capacity is high. Organic matter content is moderately low. The surface layer and subsoil range from neutral to medium acid. The shrink-swell potential is moderate, and the potential for frost action is high.

The Sabina soil, or open part of the map unit, is used for parks, building sites, lawns, and gardens. It is moderately well suited to lawns, flower and vegetable gardens, ornamental trees and shrubs, and recreational uses. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If the Sabina soil is used for grasses, flowers, vegetables, trees, or shrubs, the seasonal high water table is a limitation. Several methods of artificial drainage can be successful on this soil. Onsite investigation is needed to determine the best method for a particular area. Erosion is a hazard in areas where the surface is bare for considerable periods and in areas used as watercourses.

If the Sabina soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations, however, helps to prevent the structural damage caused by the shrinking and swelling. A drainage system is needed to lower the water table.

The seasonal high water table and the moderately slow permeability are limitations if the Sabina soil is used as a septic tank absorption field. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. If these measures are not feasible, municipal sanitary treatment should be used.

Low strength and the potential for frost action are limitations if the Sabina soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and frost action. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help to prevent the damage caused by frost action.

This map unit is not assigned to a capability class or subclass.

2481A—Raub-Urban land complex, 0 to 3 percent slopes. This nearly level map unit occurs as areas of a somewhat poorly drained Raub soil intermingled with areas of Urban land. It is on slight rises on till plains. Individual areas range from 5 to more than 400 acres in size. They are 40 to 60 percent Raub soil and 30 to 45 percent Urban land. The Raub soil and Urban land occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical area of the Raub soil, the surface soil is black and very dark grayish brown, friable loam about 18 inches thick. The subsoil is about 32 inches thick. It is yellowish brown and mottled. The upper part is friable and firm silty clay loam, and the lower part is firm clay loam. The underlying material to a depth of 60 inches is mottled yellowish brown and gray, calcareous loam. In some areas the upper part of the subsoil contains more sand. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified.

Included with the Raub soil in mapping are small areas of Dana and Drummer soils. The moderately well drained Dana soils are in convex areas above the Raub soil, and the poorly drained Drummer soils are in slight depressions and drainageways below the Raub soil. Included soils make up 10 to 25 percent of the unit.

In most areas excess water is drained through sewer systems, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless drained, the Raub soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

Water and air move through the Raub soil at a moderately slow rate. Surface runoff is slow. Available water capacity is high. Organic matter content is moderate. Reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil. The shrink-swell potential is moderate, and the potential for frost action is high.

The Raub soil, or open part of the map unit, is used for parks, building sites, lawns, and gardens. It is moderately well suited to lawns, vegetable and flower gardens, ornamental trees and shrubs, and recreational uses. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets. Erosion is a hazard on construction sites where the surface is bare and in areas used as watercourses.

If the Raub soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations, however, helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed to lower the water table.

The seasonal high water table and the moderately slow permeability are limitations if the Raub soil is used as a septic tank absorption field. Underground drains help to lower the water table. Enlarging the absorption area helps to overcome the slow absorption of liquid waste. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength and the potential for frost action are limitations if the Raub soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and frost action. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help to prevent the damage caused by frost action.

This map unit is not assigned to a capability class or subclass.

prime farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber or is available for those uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

About 576,000 acres in Champaign County, or nearly 90 percent of the total acreage, meets the requirements for prime farmland. Associations 1, 2, 3, 5, 6, and 8,

which are described under the heading, "General soil map units," have the highest percentage, but the prime farmland is throughout the county. About 530,000 acres of the prime farmland is used for crops, mainly corn and soybeans, which account for most of the local farm income each year (*6*).

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses (fig. 15). The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

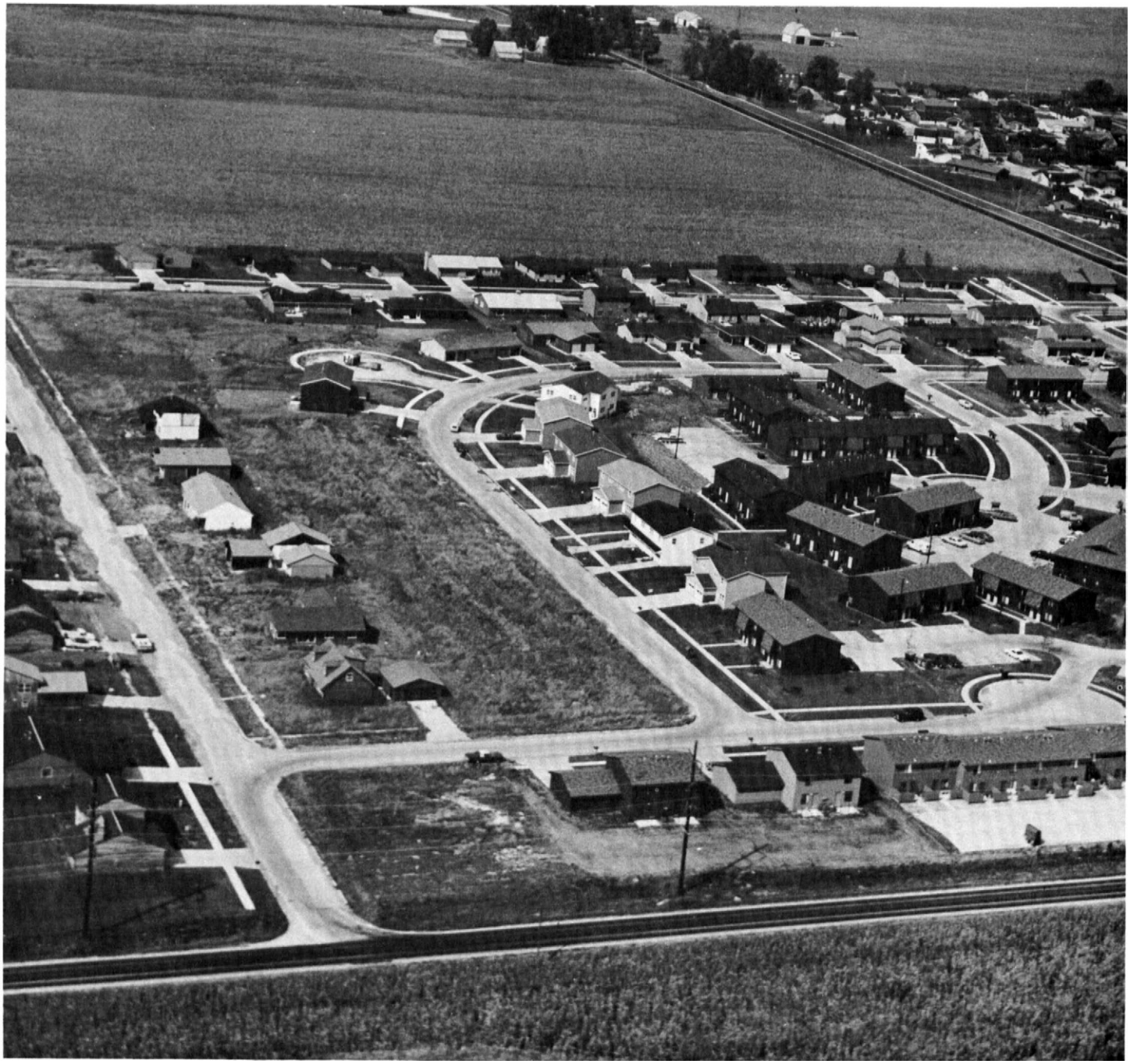

Figure 15.—Encroachment of urban development onto prime farmland.

The map units in Champaign County that meet the requirements for prime farmland are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed soil map units."

Some map units meet the requirements for prime farmland only in areas where the soil is drained. In the following list a qualification is added in parenthesis after the name of these map units. Onsite evaluation is needed to determine whether or not a specific area of the soil is adequately drained. In Champaign County the naturally wet soils have been adequately drained.

The map units in Champaign County that are prime farmland are:

23A—Blount silt loam, 0 to 2 percent slopes (where drained)
23B—Blount silt loam, 2 to 5 percent slopes (where drained)
27B—Miami silt loam, 2 to 5 percent slopes
56B—Dana silt loam, 2 to 5 percent slopes
67—Harpster silty clay loam (where drained)
73—Ross silt loam
91B—Swygert silty clay loam, 1 to 5 percent slopes
102A—La Hogue loam, 0 to 3 percent slopes
125—Selma loam (where drained)
131B—Alvin sandy loam, 1 to 5 percent slopes
134B—Camden silt loam, 1 to 5 percent slopes
146B—Elliott silt loam, 1 to 5 percent slopes
148B—Proctor silt loam, 1 to 5 percent slopes
149A—Brenton silt loam, 0 to 3 percent slopes
150B—Onarga sandy loam, 1 to 5 percent slopes
152—Drummer silty clay loam (where drained)
153—Pella silty clay loam (where drained)
154A—Flanagan silt loam, 0 to 3 percent slopes
171B—Catlin silt loam, 2 to 7 percent slopes
194B—Morley silt loam, 2 to 5 percent slopes
198A—Elburn silt loam, 0 to 3 percent slopes
199B—Plano silt loam, 1 to 5 percent slopes
206—Thorp silt loam (where drained)
219—Millbrook silt loam (where drained)
221B—Parr silt loam, 2 to 5 percent slopes
223B2—Varna silt loam, 2 to 5 percent slopes, eroded
232—Ashkum silty clay loam (where drained)
233B—Birkbeck silt loam, 1 to 5 percent slopes
234A—Sunbury silt loam, 0 to 3 percent slopes
235—Bryce silty clay (where drained)
236A—Sabina silt loam, 0 to 3 percent slopes (where drained)
242A—Kendall silt loam, 0 to 3 percent slopes (where drained)
243B—St. Charles silt loam, 1 to 5 percent slopes
291B—Xenia silt loam, 2 to 5 percent slopes
302—Ambraw silty clay loam (where drained)
330—Peotone silty clay loam (where drained)
387B—Ockley silt loam, 1 to 5 percent slopes
398A—Wea silt loam, 0 to 3 percent slopes
402—Colo silty clay loam (where drained)
440B—Jasper loam, 1 to 5 percent slopes
448B—Mona silt loam, 2 to 7 percent slopes
481A—Raub silt loam, 0 to 3 percent slopes
490A—Odell silt loam, 0 to 3 percent slopes
570B—Martinsville silt loam, 2 to 5 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Harvey Sundmaker, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 558,800 acres in Champaign County is cropland, 13,400 acres is permanent pasture, and 7,000 acres is woodland. The rest is used for roads or occurs as built-up areas or other areas (*6*). The soils have good potential for increased production of crops, particularly corn and soybeans. This soil survey can be used as a valuable guide to the latest management techniques that increase food and fiber production.

The chief management needs in the county are measures that control erosion and soil blowing, drain the wetter soils, and maintain fertility and tilth.

Soil erosion is a major problem on about 4 percent on the cropland and pasture in the county. It is a hazard if the slope is more than 2 percent or even if the slope is more than 1 percent and runoff is concentrated.

Sheet erosion, or loss of the surface layer, is damaging for three reasons. First, the productivity of most soils is reduced if the surface layer is eroded away and the subsoil is incorporated into a plow layer. Second, severe erosion on sloping soils impairs the tilth of the surface soil and reduces the rate of water intake. It is especially damaging on clayey soils, which tend to be cloddy if worked when wet and to crust after a hard rain. As a result of the cloddiness, preparing a good seedbed is difficult. As a result of the surface crusting, the runoff rate is increased. Third, uncontrolled erosion allows sediment to enter drainage ditches, streams, lakes, rivers, and road ditches. Removing this sediment is expensive. Management that controls erosion also helps to prevent pollution by sediment and improves water quality for municipal and recreational uses and for fish and wildlife.

Terraces, contour farming, and conservation tillage help to control erosion. They also increase the rate of water intake and reduce the runoff rate. Terraces are most effective in areas where slopes are smooth and uniform. A system of conservation tillage that leaves crop residue on the surface throughout the year, such as no-till or zero-till and chisel planting, can significantly

reduce the extent of erosion on many soils in the county. No-till is most effective on moderately well drained and well drained soils. Till-plant or ridge-plant systems are more effective on somewhat poorly drained soils.

Soil blowing is a hazard during part of the winter and early in spring. The hazard can be reduced by maintaining a plant cover, leaving crop residue on the surface throughout the winter, or keeping the surface rough. Windbreaks of suitable trees or shrubs also are effective in controlling soil blowing.

Further information about measures that control erosion and soil blowing is provided in the Technical Guide, available in local offices of the Soil Conservation Service.

A drainage system has been installed on about 80 percent of the acreage used for crops and pasture in the county. Most of the soils are naturally so wet that the production of crops commonly grown in the county is not feasible without drainage systems and ditches. These are the poorly drained Ashkum, Bryce, Drummer, Selma, and Thorp and very poorly drained Peotone soils on uplands and the poorly drained Ambraw and Colo soils on bottom land. Unless drained, somewhat poorly drained soils are wet enough in some years for crop growth and productivity to be reduced (*4*). Examples are Brenton, Elburn, Flanagan, and Raub soils.

The design of surface and subsurface drainage systems varies with the kind of soil. Tile drains alone are inadequate in many soils. A combination of shallow surface drains and tile drains is needed in some areas of poorly drained and very poorly drained soils. Tile drains are not effective in Bryce, Swygert, and other slowly permeable or very slowly permeable soils unless surface inlets are used to drain wet spots. Moderately permeable and moderately slowly permeable soils can be adequately drained by tile if outlets are available.

Information about the drainage system suitable for each kind of soil is provided in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally medium to high in most soils in the county. Most of the dark colored soils are neutral in reaction, and all of the light colored soils are naturally acid. On most acid soils, applications of agricultural limestone raise the pH level high enough for optimum plant growth. Harpster soils should not be limed, however, because they have secondary carbonates in the surface layer.

Most of the light colored soils have a naturally low supply of nitrogen. Some crops, particularly corn and wheat, respond well to applications of nitrogen fertilizer. Planting legumes, which take nitrogen from the air, and adding livestock waste help to replenish the nitrogen supply.

Additions of lime, nitrogen, phosphorus, potassium, or other elements needed for optimum yields should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor influencing the germination of seeds, the amount of runoff, and the intake of water into the soil. Surface soil that is in good tilth is granular and porous. Poor tilth is a problem in the light colored, clayey Chatsworth soils; the dark colored, clayey Bryce soils; and the sloping Varna soils. These soils often stay wet until late in spring. If plowed when wet, they tend to be very cloddy. As a result, preparing a good seedbed is difficult. Chisel plowing or tilling in the fall generally results in good tilth in the spring if crop residue is left on the surface.

The field crops suited to the soils and climate of the survey area include many that are not commonly grown. Soybeans and corn are the main crops. Champaign County ranks within the top five counties in Illinois in the production of corn and soybeans. Wheat is the main close-growing crop. Oats also is grown in a few fields.

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 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; 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 residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops

that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*9*). Only class and subclass are used in this survey.

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. The classes are defined as follows:

Class I soils have slight 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 or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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 very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section 'Detailed soil map units."

woodland management and productivity

When the first settlers arrived, virgin forest covered about 7 percent of the acreage in Champaign County. Since then, the trees have been cleared from most of the land suitable for cultivation. Much of the remaining woodland is in areas that are too steep or too wet for cultivation. The soils in these areas have fair to good potential for growing trees of high quality if the woodland is properly managed.

About 7,000 acres, or 1 percent of the acreage in the county, is woodland. About 40 percent of this acreage is owned by the county forest preserve district and the University of Illinois. The rest is privately owned. The largest areas of woodland are in associations 4, 6, and 9, which are described under the heading "General soil map units." The main species are shagbark hickory, white oak, and red oak in the uplands and cottonwood, sycamore, and hickory on the bottom land.

Many of the stands can be improved by measures that thin out mature trees and remove undesirable species. Measures that exclude grazing livestock, prevent fires, and control disease and insects also are needed.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *c* indicates clay in the upper part of the soil and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is *c* and then *r*.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates

that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, keep snow from blowing off the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 7 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 7 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

Only about 1 percent of the acreage in Champaign County is used for recreational purposes. The increasing metropolitan population has placed a burden on the existing recreational facilities. Because of other land uses, such as farming, building site development, and commercial and industrial development, the tracts available for recreational uses commonly are the less desirable ones. Lake of the Woods Park is the busiest recreational area in the county (fig. 16). Other facilities scattered throughout the county include golf courses, playgrounds, athletic fields, swimming pools, and camping and picnic areas.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that 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 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping

and leveling the 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 have mild slopes and are not wet or 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 campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for 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 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 are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the

Figure 16.—An area of Lake of the Woods Park.

depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Steven J. Brady, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features 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. Examples of grain and seed crops are corn, wheat, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features 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. Examples of grasses and legumes are bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features 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. Examples of wild herbaceous plants are bluestem, goldenrod, ragweed, foxtail, and smartweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, 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 wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, frogs, turtles, and snakes.

The kind and abundance of wildlife in Champaign County reflect the soil types, land use, and vegetation. About 80 percent of the soils originally had a seasonal high water table within 1 foot of the surface, and nearly half had one at or above the surface. Although some areas, especially those along rivers, were wooded, the native plant communities were dominated by tall prairie grasses. Because they were influenced by the seasonal high water table, they included many wet prairie or marsh plants.

Wildlife that were formerly abundant include waterfowl, shore birds, muskrat, mink, raccoons, prairie chickens, upland sandpipers, and other grassland birds and mammals. The transition areas between prairie and woodland provided habitat for cottontail rabbits, bobwhite quail, cardinals, brown thrashers, and many other kinds of wildlife. Less conspicuous, but a very important part of the natural fauna, were the reptiles and amphibians of the wet prairie.

After the county was settled, drainage systems, intensive cultivation, and urbanization altered the wildlife communities. They tended to favor the more adaptable species and those more tolerant of human settlements, such as horned larks, cardinals, mourning doves, raccoons, and white-tailed deer.

In the following paragraphs the associations in Champaign County, which are described under the heading "General soil map units," are grouped into three wildlife areas. The plants and animals common in the three areas are specified.

Wildlife Area 1 is on the Drummer-Flanagan, Drummer-Raub, Dana-Parr-Drummer, Drummer-Elburn-Brenton, Varna-Elliott-Ashkum, Elliott-Ashkum, and Swygert-Bryce associations. It does not include areas where a significant part of the acreage is urban land. The soils are nearly level to strongly sloping and range from very poorly drained to well drained. They are on uplands.

This area is mainly cropland. A few small areas are pastured or wooded. The areas along field borders and the minor streams, the meadows, and the pastured areas provide habitat for openland wildlife. The wildlife attracted to this area include cottontail rabbits, red fox, pheasant, and many types of songbirds.

Measures that keep the pastures in good condition, measures that exclude livestock from wooded areas, a system of conservation tillage that leaves crop residue on the surface after planting, and deferment of mowing in grassy areas until August are beneficial. Seeding roadsides, fence rows, and travel lanes to perennial plants, such as smooth bromegrass, alfalfa, and alsike clover, or allowing the perennial native prairie grasses, such as bluestem, switchgrass, and cordgrass, to dominate helps to control undesirable weeds and provides good wildlife cover.

Wildlife Area 2 is on the Drummer-Xenia, Drummer-Kendall-St. Charles, Morley-Blount-Ashkum, and Colo-Ross associations. It does not include areas where a significant part of the acreage is urban land. The soils are nearly level to strongly sloping and range from poorly drained to well drained. Those in the Colo-Ross association are subject to flooding. This area is mainly on forested uplands and bottom land along the major streams. Some of the acreage is cropland, open meadows, or wetland. The wildlife population is more diversified than that in Wildlife Area 1. It includes a variety of wetland, woodland, and openland wildlife. Examples are deer, squirrels, raccoons, pheasants, rabbits, muskrats, frogs, snakes, and many types of birds.

Native trees, shrubs, and prairie plants provide the best cover if measures that exclude grazing livestock are applied. Establishing hedgerows, farm windbreaks, and strips of grass or grass-legume mixtures improves the area.

Wildlife Area 3 is on parts of the associations where much of the acreage is urban land. The soils are nearly level to sloping and range from poorly drained to well drained.

Although much of this area is under urban development, some of the acreage is used for parks or is idle land. The wildlife species are mainly those that can adapt to urban conditions. Examples are gray squirrels, fox squirrels, mice, cardinals, song sparrows, robins, pigeons, and blue jays. The few open areas attract pheasant, quail, rabbits, and songbirds.

Planting food-bearing ornamental trees and shrubs provides habitat diversity and cover valuable to wildlife, especially to songbirds. Examples of plants suitable for landscaping are oak, maple, cherry, silky dogwood, flowering dogwood, crabapple, Amur honeysuckle, viburnum, pyracantha, elderberry, and sumac.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water

management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary

landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups 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 (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. 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. 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. 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. 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. 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. 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. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. 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 having a layer that impedes the downward movement of water or soils of 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 clays 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, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal 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.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil series and their morphology." The soil samples were tested by the Illinois Department of Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that 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 development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*8*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*10*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alvin series

The Alvin series consists of well drained, moderately rapidly permeable soils on outwash plains and low stream terraces. These soils formed in windblown or water-deposited loamy and sandy material. Slopes range from 1 to 5 percent.

Alvin soils commonly are adjacent to Ambraw, Colo, and La Hogue soils. All of the adjacent soils have a mollic epipedon and contain more clay and less sand in the control section than the Alvin soils. The poorly drained Ambraw and Colo soils are on bottom land and

the somewhat poorly drained La Hogue soils on outwash plains below the Alvin soils.

Typical pedon of Alvin sandy loam, 1 to 5 percent slopes, 165 feet north and 1,220 feet east of the southwest corner of sec. 31, T. 19 N., R. 14 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A21—8 to 12 inches; brown (10YR 5/3) sandy loam, very pale brown (10YR 7/3) dry; weak medium platy structure; very friable; few thin light gray (10YR 7/2) silica coatings on faces of peds; slightly acid; abrupt smooth boundary.

A22—12 to 20 inches; yellowish brown (10YR 5/4) sandy loam, very pale brown (10YR 7/4) dry; weak platy structure parting to weak medium subangular blocky; friable; common thin light gray (10YR 7/2) silica coatings on faces of peds; medium acid; clear smooth boundary.

B1—20 to 30 inches; yellowish brown (10YR 5/4) sandy loam; weak medium prismatic structure; friable; medium acid; clear smooth boundary.

B2t—30 to 43 inches; yellowish brown (10YR 5/4) loam; weak medium prismatic structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B3—43 to 66 inches; brown (7.5YR 4/3) stratified loamy sand, sandy loam, and sandy clay loam; weak coarse prismatic structure; friable; few thin dark brown (7.5YR 3/2) organic stains on faces of peds; medium acid.

The thickness of the solum ranges from 50 to 70 inches. The Ap horizon has chroma of 2 or 3. The A horizon is sandy loam or fine sandy loam. The B1 and B2t horizons have hue of 10YR or 7.5YR and value and chroma of 4 to 6. They are medium acid or strongly acid. They are loam, sandy clay loam, or sandy loam. The clay content ranges from 15 to 18 percent in the control section. The C horizon, if it occurs, has strata of sandy loam, loamy sand, and sand.

Ambraw series

The Ambraw series consists of poorly drained, moderately slowly permeable or moderately permeable soils on bottom land and low stream terraces. These soils formed in stratified loamy stream sediments. Slopes range from 0 to 2 percent.

The Ambraw soils in this county contain more sand and less clay in the subsoil than is definitive for the Ambraw series. Also, the B2g horizon has a higher pH and the content of organic carbon decreases more continuously. These differences, however, do not significantly affect the use or behavior of the soils.

Ambraw soils commonly are adjacent to the higher lying, well drained Ross soils on slight rises.

Typical pedon of Ambraw silty clay loam, 1,040 feet south and 70 feet east of the northwest corner of sec. 14, T. 22 N., R. 7 E.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; gray (10YR 6/1) silt coatings; neutral; clear smooth boundary.

A12—8 to 15 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; neutral; clear smooth boundary.

B1g—15 to 21 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

B21g—21 to 30 inches; dark gray (5Y 4/1) loam; common medium prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; many moderately thick very dark gray (10YR 3/1) organic films lining pores; neutral; clear smooth boundary.

B22g—30 to 40 inches; gray (5Y 5/1) loam; many coarse prominent yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure; friable; weak stratification; common thin very dark gray (10YR 3/1) organic films lining pores; black (10YR 2/1) krotovinas at 37 inches; neutral; clear smooth boundary.

Cg—40 to 60 inches; gray (5Y 5/1) stratified loam, clay loam, loamy sand, and sand; many prominent yellowish brown (10YR 5/4 and 5/6) mottles; massive; friable; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is clay loam, silty clay loam, or loam. The Blg horizon has value of 3 or 4 and chroma of 1 to 4. It is clay loam or loam and is neutral or slightly acid. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 2. The Cg horizon has strata that vary in texture. It ranges from slightly acid to mildly alkaline.

Ashkum series

The Ashkum series consists of poorly drained, moderately slowly permeable soils in drainageways on till plains. These soils formed in silty and clayey material and in the underlying silty clay loam glacial till. Slopes range from 0 to 2 percent.

Ashkum soils commonly are adjacent to Elliott and Varna soils. Both of the adjacent soils have an argillic B horizon. The somewhat poorly drained Elliott soils are higher on the landscape than the Ashkum soils. The moderately well drained Varna soils are in the more sloping areas above the Ashkum soils.

Typical pedon of Ashkum silty clay loam, 40 feet north and 2,160 feet east of the southwest corner of sec. 11, T. 22 N., R. 10 E.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; weak medium angular blocky structure; firm; neutral; abrupt smooth boundary.

A12—10 to 17 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct dark grayish brown (2.5Y 4/2) mottles; moderate medium granular structure; firm; neutral; clear smooth boundary.

B21—17 to 25 inches; dark grayish brown (2.5Y 4/2) silty clay; common medium distinct light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; continuous moderately thick black (10YR 2/1) organic films on faces of peds; neutral; clear smooth boundary.

B22g—25 to 39 inches; dark gray (5Y 4/1) silty clay; common medium distinct olive (5Y 5/6) mottles; moderate fine and medium prismatic structure; firm; continuous moderately thick very dark gray (5Y 3/1) organic films on faces of peds; neutral; clear smooth boundary.

IIB3g—39 to 56 inches; gray (5Y 5/1) silty clay loam; many coarse distinct olive (5Y 5/6) mottles; moderate coarse prismatic structure; firm; continuous moderately thick dark gray (5Y 4/1) clay films on faces of peds; few moderately thick very dark gray (5Y 3/1) organic films lining root channels and pores; few pebbles; mildly alkaline; gradual smooth boundary.

IIC—56 to 72 inches; mottled gray (5Y 5/1) and yellowish brown (10YR 5/6) silty clay loam; massive; firm; few thin very dark gray (5Y 3/1) films on pressure faces in the upper part; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. The thickness of the overlying silty and clayey material ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is silty clay loam or silty clay. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It ranges from slightly acid to mildly alkaline. It is silty clay loam or silty clay. The clay content ranges from 35 to 42 percent in the control section. The IIB horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It ranges from slightly acid to moderately alkaline. The IIC horizon is mildly alkaline or moderately alkaline.

Birkbeck series

The Birkbeck series consists of moderately well drained, moderately permeable soils on the till plains. These soils formed in loess and in the underlying calcareous, loamy glacial till. Slopes range from 1 to 5 percent.

Birkbeck soils commonly are adjacent to Drummer, Sabina, and Sunbury soils. The poorly drained Drummer soils are in drainageways and depressions below the Birkbeck soils. They do not have an argillic B horizon and have a mollic epipedon. The somewhat poorly drained Sabina and Sunbury soils are lower on the landscape than the Birkbeck soils. They have a fine textured subsoil. Also, Sunbury soils have a mollic surface layer.

Typical pedon of Birkbeck silt loam, 1 to 5 percent slopes, 900 feet south and 2,370 feet west of the northeast corner of sec. 31, T. 19 N., R. 14 W.

A1—0 to 5 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A2—5 to 11 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium platy structure; friable; medium acid; abrupt smooth boundary.

B1—11 to 15 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—15 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; many thin brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—25 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—37 to 46 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB2—46 to 60 inches; mottled yellowish brown (10YR 5/4) and pale brown (10YR 6/3) clay loam; many medium yellowish red (5YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; slightly acid; clear smooth boundary.

IIC—60 to 70 inches; mottled yellowish brown (10YR 5/4) and pale brown (10YR 6/3) loam; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 44 to 70 inches. The thickness of the overlying loess ranges from 40 to 60 inches.

The A1 or Ap horizon has value of 3 or 4 and chroma of 1 to 3. The A2 horizon has value of 4 or 5 and chroma of 2 to 4. The B2t horizon has value of 4 or 5 and chroma of 3 or 4. It is medium acid or slightly acid. The clay content ranges from 27 to 35 percent in the control section. The IIB horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is loam, clay loam, silty clay loam, or silt loam. It ranges from slightly acid to mildly alkaline. The IIC horizon is loam or clay loam.

Blount series

The Blount series consists of somewhat poorly drained, slowly permeable or moderately slowly permeable soils on upland till plains near streams and drainageways. These soils formed in silty clay loam glacial till. Slopes range from 0 to 5 percent.

Blount soils commonly are adjacent to Ashkum and Morley soils. The poorly drained Ashkum soils are in drainageways and depressions below the Blount soils. They have a mollic epipedon and do not have an argillic B horizon. The moderately well drained Morley soils are higher on the landscape than the Blount soils.

Typical pedon of Blount silt loam, 0 to 2 percent slopes, 125 feet south and 835 feet east of the northwest corner of sec. 24, T. 21 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 11 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak thin platy structure parting to weak fine granular; friable; common dark grayish brown (10YR 4/2) silt coatings on faces of peds; slightly acid; abrupt smooth boundary.

B21t—11 to 17 inches; brown (10YR 5/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and few fine distinct light gray (10YR 7/1) mottles; moderate fine angular blocky structure; firm; continuous moderately thick grayish brown (10YR 5/2) clay films on faces of peds; few fine black accumulations (iron and manganese oxide); very strongly acid; clear smooth boundary.

B22t—17 to 23 inches; grayish brown (10YR 5/2) silty clay; many medium distinct yellowish brown (10YR 5/6) and common coarse distinct dark yellowish brown (10YR 4/4) mottles; moderate fine prismatic structure; firm; continuous moderately thick grayish brown (2.5Y 5/2) clay films on faces of peds; few medium black accumulations (iron and manganese oxide); very strongly acid; clear smooth boundary.

B23tg—23 to 32 inches; grayish brown (10YR 5/2) silty clay; many coarse distinct yellowish brown (10YR 5/6) and common coarse distinct dark yellowish brown (10YR 4/4) mottles; moderate medium prismatic structure; firm; continuous moderately thick gray (N 5/0) clay films on faces of peds; common medium black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

B3t—32 to 40 inches; mottled silty clay, 60 percent yellowish brown (10YR 5/6) and 40 percent gray (10YR 6/1); moderate coarse prismatic structure; firm; common moderately thick very dark gray (10YR 3/1) and common thin dark gray (10YR 4/1) clay films lining pores; neutral; clear smooth boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common coarse distinct gray (N 6/0) mottles; massive; firm; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 45 inches. The depth to free carbonates ranges from 20 to 40 inches.

The Ap horizon has chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It ranges from very strongly acid to slightly acid. It is silty clay loam or silty clay. The clay content ranges from 35 to 48 percent in the control section. The B3 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It is silty clay loam or silty clay. It ranges from slightly acid to mildly alkaline. The C horizon is silty clay loam or clay loam. It is mildly alkaline or moderately alkaline.

Brenton series

The Brenton series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess or silty sediments and in the underlying loamy outwash or alluvium. Slopes range from 0 to 3 percent.

Brenton soils commonly are adjacent to Drummer and Proctor soils. The poorly drained Drummer soils are in drainageways below the Brenton soils. They do not have an argillic B horizon. The moderately well drained Proctor soils are on slopes above the Brenton soils.

Typical pedon of Brenton silt loam, 0 to 3 percent slopes, 1,722 feet south and 114 feet east of the northwest corner of sec. 10, T. 22 N., R. 8 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A3—10 to 16 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

B21t—16 to 26 inches; brown (10YR 4/3) silty clay loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; continuous thin dark grayish brown (10YR 4/2) clay films lining roots and pores; many thin very dark gray (10YR 3/1) clay films on faces of peds; neutral; clear smooth boundary.

B22t—26 to 35 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct light gray (10YR 7/2), brownish yellow (10YR 6/6), and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common thin very dark gray (10YR 3/1) clay films on faces of peds; many thin dark grayish brown (10YR 4/2) clay films lining pores; few fine rounded black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIB3t—35 to 53 inches; dark yellowish brown (10YR 4/4) and brown (10YR 5/3) clay loam; common fine distinct very pale brown (10YR 7/3) mottles; moderate medium prismatic structure; friable; common thin dark grayish brown (10YR 4/2) and few thin very dark grayish brown (10YR 3/2) organic clay films on faces of peds; few fine rounded black accumulations (iron and manganese oxide); slightly acid; abrupt smooth boundary.

IIC—53 to 72 inches; mottled brownish yellow (10YR 6/8) and light gray (10YR 7/2) silt loam and sandy loam stratified with thin layers of loamy sand; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 38 to 60 inches. The thickness of the overlying silty material ranges from 25 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 22 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It ranges from medium acid to neutral. The clay content ranges from 27 to 35 percent in the control section. The IIB3 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 to 8. It is silt loam, loam, sandy loam, or clay loam. It ranges from slightly acid to mildly alkaline. The IIC horizon has strata of silt loam, loam, sandy loam, and loamy sand.

Bryce series

The Bryce series consists of poorly drained, slowly permeable soils on till plains. These soils formed in colluvial material over silty clay glacial till. Slopes range from 0 to 2 percent.

Bryce soils commonly are adjacent to Blount, Elliott, and Swygert soils. All of the adjacent soils are somewhat poorly drained and are on slight rises above the Bryce soils. They have an argillic B horizon. Also, Blount soils do not have a mollic epipedon, and Elliott soils formed in silty clay loam glacial till.

Typical pedon of Bryce silty clay, 65 feet south and 1,100 feet west of the northeast corner of sec. 5, T. 22 N., R. 14 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate medium angular blocky structure; firm; neutral; clear smooth boundary.

A12—8 to 14 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; few medium distinct dark grayish brown (2.5Y 4/2) mottles; moderate medium granular structure; firm; neutral; clear smooth boundary.

B1g—14 to 20 inches; dark gray (5Y 4/1) silty clay; few medium distinct olive brown (2.5Y 4/3) mottles; moderate medium subangular blocky structure; very firm; many moderately thick very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

B21tg—20 to 26 inches; dark gray (5Y 4/1) silty clay; common fine distinct olive (5Y 5/4) mottles; moderate medium prismatic structure; very firm; discontinuous moderately thick dark gray (5Y 4/1) clay films on faces of peds; neutral; gradual smooth boundary.

B22tg—26 to 33 inches; dark gray (5Y 4/1) silty clay; many medium distinct olive (5Y 5/6) mottles; moderate medium prismatic structure; very firm; discontinuous moderately thick dark gray (5Y 4/1) clay films on faces of peds; neutral; gradual smooth boundary.

B3tg—33 to 50 inches; olive gray (5Y 5/2) silty clay; many coarse prominent light olive brown (2.5Y 5/6) mottles; moderate coarse prismatic structure; very firm; discontinuous moderately thick gray (5Y 5/1) clay films on faces of peds; common very thin iron stains; neutral; gradual smooth boundary.

IICg—50 to 60 inches; mottled gray (5Y 6/1) and olive (5Y 5/3) silty clay; massive; some pressure faces; very firm; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is silty clay or silty clay loam. The B2g horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. It is neutral or mildly alkaline. It is silty clay or clay. The clay content in the 10- to 40-inch control section ranges from 42 to 50

percent. The Cg horizon is silty clay loam or silty clay. It is mildly alkaline or moderately alkaline.

Camden series

The Camden series consists of well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying stratified, medium textured glacial outwash. Slopes range from 1 to 5 percent.

Camden soils commonly are adjacent to Drummer and Kendall soils. The poorly drained Drummer soils are in drainageways and depressions below the Camden soils. They have a mollic epipedon and do not have an argillic B horizon. The somewhat poorly drained Kendall soils are lower on the landscape than the Camden soils. Also, more of their subsoil formed in loess.

Typical pedon of Camden silt loam, 1 to 5 percent slopes, 100 feet west and 30 feet north of the southeast corner of sec. 6, T. 22 N., R. 14 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and very fine granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate thin platy structure; friable; few thin light brownish gray (10YR 6/2) silt coatings on faces of peds; neutral; abrupt smooth boundary.

B1t—14 to 18 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; friable; many thin brown (10YR 4/3) clay films and few thin light brownish gray (10YR 6/2) silt coatings on faces of peds; neutral; clear smooth boundary.

B21t—18 to 22 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; many thin brown (10YR 4/3) clay films and few thin light brownish gray (10YR 6/2) silt coatings on faces of peds; slightly acid; clear smooth boundary.

B22t—22 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); few chert pebbles; medium acid; clear smooth boundary.

B23t—28 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; common fine and medium irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

IIB24t—35 to 52 inches; yellowish brown (10YR 5/6) loam; few fine faint yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; common fine and medium irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

IIB3—52 to 62 inches; mixed brown (10YR 4/3) and yellowish brown (10YR 5/4) sandy loam; few fine faint brown (10YR 5/3) mottles; weak coarse prismatic structure; friable; few thin brown (10YR 4/3) clay films as bridges across sand grains; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

IIC—62 to 77 inches; yellowish brown (10YR 5/4 and 5/6) stratified sandy loam, loam, and sandy clay loam; massive; very friable; medium acid.

The thickness of the solum ranges from 40 to 65 inches. The thickness of the overlying silty material ranges from 24 to 40 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The A2 horizon has value of 4 to 6 and chroma of 2 to 4. The Bt and IIB horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. The clay content ranges from 27 to 35 percent in the control section. The Bt horizon ranges from strongly acid to neutral. The IIB horizon is clay loam, sandy loam, or silt loam. It ranges from medium acid to neutral. The IIC horizon is dominantly stratified loam, sandy loam, and silt loam but has thin strata of other textures. It ranges from medium acid to moderately alkaline.

Catlin series

The Catlin series consists of moderately well drained, moderately permeable soils on till plains and moraines. These soils formed in loess and in the underlying loam glacial till. Slopes range from 2 to 7 percent.

Catlin soils commonly are adjacent to Drummer, Elburn, and Flanagan soils. The poorly drained Drummer soils are in drainageways and depressions below the Catlin soils. They do not have an argillic B horizon. The somewhat poorly drained Elburn and Flanagan soils are lower on the landscape than the Catlin soils. Elburn soils are underlain by stratified, medium textured outwash, and Flanagan soils contain more clay in the control section than the Catlin soils.

Typical pedon of Catlin silt loam, 2 to 7 percent slopes, 287 feet north and 1,362 feet east of the southwest corner of sec. 20, T. 19 N., R. 9 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

B1t—11 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; friable; continuous thin very dark

grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

B21t—15 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; many thin very dark grayish brown (10YR 3/2) clay films; medium acid; clear smooth boundary.

B22t—22 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B23t—30 to 45 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine faint light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; common thick very dark grayish brown (10YR 3/2) root channel fillings; common thin irregular dark accumulations (iron and manganese oxide); slightly acid; clear wavy boundary.

B3t—45 to 57 inches; light olive brown (2.5YR 5/4) clay loam; common fine distinct light olive gray (5Y 6/2) and few fine distinct strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; firm; common thin brown (10YR 4/3) clay films on faces of peds; common moderately thick very dark grayish brown (10YR 3/2) root channel fillings; common fine irregular dark accumulations (iron and manganese oxide); neutral; clear wavy boundary.

IIC—57 to 70 inches; light olive brown (2.5Y 5/4) loam; massive; firm; common moderately thick very dark grayish brown (10YR 3/2) fillings in the upper part; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 45 to 65 inches. The thickness of the mollic epipedon ranges from 11 to 17 inches. The thickness of the overlying silty material ranges from 40 to 60 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The B1 horizon has value and chroma of 3 or 4. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The clay content ranges from 27 to 35 percent in the control section. The IIB3 horizon is silt loam, loam, clay loam, or silty clay loam.

Chatsworth series

The Chatsworth series consists of moderately well drained, very slowly permeable soils on moraines. These soils formed in clayey glacial till. Slopes range from 7 to 15 percent.

Chatsworth soils commonly are adjacent to the poorly drained Bryce and somewhat poorly drained Swygert soils. Both of the adjacent soils are lower on the landscape than the Chatsworth soils. They have a mollic epipedon. Also, Swygert soils have an argillic B horizon.

Typical pedon of Chatsworth silty clay, 7 to 15 percent slopes, 2,425 feet south and 30 feet west of the northeast corner of sec. 5, T. 22 N., R. 9 E.

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) dry; weak fine angular blocky structure; firm; common thin very dark grayish brown (2.5Y 3/2) organic films on faces of peds; common granite pebbles and shale flakes; slight effervescence; mildly alkaline; abrupt smooth boundary.

B2tg—8 to 19 inches; mottled olive gray (5Y 5/2) and olive (5Y 5/3) silty clay; common fine faint gray (5Y 5/1) mottles; strong medium angular blocky structure; very firm; few thin dark gray (5Y 4/1) clay films on faces of peds; common granite pebbles and shale flakes; strong effervescence; moderately alkaline; clear smooth boundary.

Cg—19 to 60 inches; mottled gray (5Y 5/1), olive gray (5Y 5/2), and olive (5Y 5/3) silty clay; moderate coarse angular blocky pressure faces in the upper part and massive at 25 inches; extremely firm; few granite pebbles and shale flakes; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 20 inches. The depth to free carbonates ranges from 0 to 8 inches.

The Ap horizon has hue of 10YR or 2.5Y and value of 4 or 5. It is typically silty clay but in some pedons is silt loam or silty clay loam. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 3. It is mildly alkaline or moderately alkaline. It is silty clay loam, silty clay, or clay. The clay content ranges from 35 to 60 percent in the 10- to 40-inch control section. The C horizon is silty clay or silty clay loam.

Colo series

The Colo series consists of poorly drained, moderately permeable soils on bottom land. These soils formed in noncalcareous, silty and loamy alluvial sediments. Slopes range from 0 to 2 percent.

Colo soils commonly are adjacent to the well drained Alvin and Ross soils. Both of the adjacent soils are higher on the landscape than the Colo soils. Also, they contain more sand in the control section. Alvin soils do not have a mollic epipedon.

Typical pedon of Colo silty clay loam, 600 feet north and 180 feet east of the southwest corner of sec. 11, T. 20 N., R. 7 E.

A11—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak thin platy structure; friable; common thin dark grayish brown (10YR 4/2)

silt coatings on faces of peds; neutral; clear smooth boundary.

A12—9 to 23 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; neutral; gradual smooth boundary.

A13—23 to 38 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine and medium angular and subangular blocky structure; friable; neutral; gradual smooth boundary.

B2—38 to 50 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common fine prominent olive (5Y 5/3) and few coarse prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; neutral; gradual smooth boundary.

Cg—50 to 68 inches; mottled clay loam, 20 percent dark grayish brown (2.5Y 4/2) and 80 percent gray (5Y 5/1); many coarse distinct strong brown (7.5YR 4/6) and common coarse distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; friable; common fine irregular dark accumulations (iron and manganese oxide); neutral.

The thickness of the solum ranges from 36 to 54 inches. The mollic epipedon ranges from 36 to 50 inches in thickness.

The A horizon has hue of 10YR or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The clay content ranges from 27 to 35 percent in the 10- to 40-inch control section. Reaction is slightly acid or neutral.

Dana series

The Dana series consists of moderately well drained soils on till plains and moraines. These soils formed in loess and in the underlying calcareous loam till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 5 percent.

Dana soils commonly are adjacent to Drummer, Flanagan, and Raub soils on the lower parts of the landscape. The poorly drained Drummer soils are in drainageways and depressions. They do not have an argillic B horizon. The somewhat poorly drained Flanagan soils are on toe slopes. They contain more clay in the control section than the Dana soils. Raub soils are somewhat poorly drained.

Typical pedon of Dana silt loam, 2 to 5 percent slopes, 700 feet north and 225 feet east of the southwest corner of sec. 5, T. 18 N., R. 14 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

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

B21t—12 to 18 inches; brown (10YR 4/3) silty clay loam; moderate fine and very fine subangular blocky structure; friable; common thin very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

B22t—18 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/6) mottles in the lower part; weak medium prismatic structure parting to moderate medium subangular blocky; friable; continuous thin brown (10YR 4/3) clay films on faces of peds; few fine irregular black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

B23t—27 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; continuous thin dark grayish brown (10YR 4/2), brown (10YR 4/3), and very dark gray (10YR 3/1) clay films on faces of peds; common thin irregular black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIB24t—34 to 39 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct gray (5Y 6/1) and few fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common thin dark grayish brown (10YR 4/2) and brown (10YR 4/3) and few thin very dark gray (10YR 3/1) clay films on faces of peds; common thin irregular black accumulations (iron and manganese oxide); neutral; clear smooth boundary.

IIB3t—39 to 50 inches; light olive brown (2.5Y 5/4) loam; few fine faint grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure; friable; few thin dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIC—50 to 60 inches; light olive brown (2.5Y 5/4) loam; common coarse distinct gray (5Y 6/1) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 36 to 66 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2t horizon has value of 4 or 5 and chroma of 3 or 4. The clay content ranges from 27 to 35 percent in

the control section. The IIB horizon is slightly acid or neutral.

Drummer series

The Drummer series consists of poorly drained, moderately permeable soils on outwash plains or till plains. These soils formed in silty material and in the underlying stratified loamy sediments. Slopes range from 0 to 2 percent.

Drummer soils commonly are adjacent to Brenton, Catlin, Dana, Elburn, Flanagan, and Raub soils. All of the adjacent soils have an argillic B horizon. They are higher on the landscape than the Drummer soils. Brenton soils are somewhat poorly drained. They formed in a layer of silty material that is thinner than that of the Drummer soils. Catlin and Dana soils are moderately well drained. They formed in loess and in the underlying loam glacial till. Elburn, Flanagan, and Raub soils are somewhat poorly drained. Flanagan soils contain more clay in the control section than the Drummer soils and formed in loess and in the underlying glacial till. Raub soils formed in a layer of loess that is thinner than that of the Drummer soils and in the underlying glacial till.

Typical pedon of Drummer silty clay loam, 300 feet north and 1,600 feet east of the southwest corner of sec. 19, T. 19 N., R. 9 E.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; firm; many fine roots; medium acid; clear smooth boundary.

A12—7 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to weak fine granular; firm; many fine and medium roots; slightly acid; clear smooth boundary.

B1—14 to 19 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine faint very dark grayish brown (2.5Y 3/2) mottles; moderate fine and medium subangular blocky structure; firm; many fine and medium roots; slightly acid; gradual smooth boundary.

B21g—19 to 25 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine prismatic structure parting to moderate fine angular blocky; firm; many fine roots; many wormholes; neutral; gradual smooth boundary.

B22g—25 to 32 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/4) mottles; weak fine and medium prismatic structure parting to moderate fine angular blocky; firm; many fine roots; thin discontinuous dark gray (N 4/0) clay films on faces of peds; neutral; gradual wavy boundary.

B23—32 to 41 inches; yellowish brown (10YR 5/4) silty clay loam; many medium prominent gray (N 5/0) mottles; weak medium prismatic structure parting to weak medium angular blocky; firm; few fine roots; thin discontinuous dark gray (N 4/0) clay films on faces of peds; neutral; clear wavy boundary.

IIB3—41 to 47 inches; yellowish brown (10YR 5/6) loam; common medium prominent gray (N 5/0) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; abrupt wavy boundary.

IICg—47 to 60 inches; dark gray (10YR 4/1) stratified loam and sandy loam; many medium prominent olive brown (2.5Y 4/4) and gray (N 5/0) mottles; massive; friable; mildly alkaline.

The thickness of the solum ranges from 44 to 65 inches. The thickness of the overlying silty material ranges from 40 to 60 inches. The depth to free carbonates ranges from 40 to 65 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4. It ranges from medium acid to mildly alkaline. The clay content in the 10- to 40-inch control section ranges from 27 to 35 percent. The IIB3 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 8. It is loam or silty loam and in some pedons has strata of silty clay loam, clay loam, sandy clay loam, and sandy loam. It ranges from slightly acid to moderately alkaline. The IIC horizon is stratified loam, sandy loam, loamy sand, sandy clay loam, clay loam, and silty clay loam. It ranges from neutral to moderately alkaline.

Elburn series

The Elburn series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess or other silty material and in the underlying loamy outwash. Slopes range from 0 to 3 percent.

Elburn soils commonly are adjacent to Catlin, Drummer, and Plano soils. The moderately well drained Catlin and Plano soils are higher on the landscape than the Elburn soils. Also, Catlin soils formed in loam glacial till. The poorly drained Drummer soils are in drainageways and depressions below the Elburn soils. They do not have an argillic B horizon.

Typical pedon of Elburn silt loam, 0 to 3 percent slopes, 2,040 feet north and 52 feet west of the southeast corner of sec. 19, T. 19 N., R. 8 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A12—11 to 16 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine

subangular blocky structure parting to moderate medium granular; friable; brown (10YR 4/3) flecks of subsoil material in the lower part; slightly acid; abrupt smooth boundary.

B21t—16 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine prismatic structure parting to moderate fine and very fine subangular blocky; firm; common thin very dark gray (10YR 3/1) and continuous thin dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

B22t—24 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium prismatic structure; firm; common thin very dark gray (10YR 3/1) and continuous thin dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

B23tg—32 to 46 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; moderate medium prismatic structure; friable; few thin very dark gray (10YR 3/1) clay films lining pores and few thin dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

IIB3tg—46 to 57 inches; light brownish gray (2.5Y 6/2) silt loam stratified with loam and sandy loam; common coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few thin dark gray (10YR 4/1) clay films lining pores; few fine rounded dark accumulations (iron and manganese oxide); neutral; abrupt smooth boundary.

IICg—57 to 60 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) sandy loam stratified with coarse sand; massive; friable; mildly alkaline.

The thickness of the solum ranges from 45 to 70 inches. The thickness of the overlying silty material ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y and value of 4 or 5. It is medium acid to neutral. The clay content ranges from 27 to 35 percent in the control section. The IIB horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 8. It is silt loam, loam, sandy loam, or clay loam. It ranges from slightly acid to mildly alkaline. The IIC horizon has strata of silt loam, loam, sandy loam, sand, or coarse sand.

Elliott series

The Elliott series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in a thin layer of loess and in the underlying silty clay loam glacial till. Slopes range from 1 to 5 percent.

Elliott soils commonly are adjacent to Ashkum and Varna soils. The poorly drained Ashkum soils are in drainageways below the Elliott soils. They do not have an argillic B horizon. The moderately well drained Varna soils generally are in the more sloping areas above the Elliott soils.

Typical pedon of Elliott silt loam, 1 to 5 percent slopes, 50 feet north and 2,633 feet east of the southwest corner of sec. 7, T. 21 N., R. 8 E.

Ap—0 to 12 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak medium angular blocky structure parting to moderate medium granular; friable; neutral; abrupt smooth boundary.

IIB21tg—12 to 20 inches; light olive brown (2.5Y 5/4) silty clay; few fine faint grayish brown (10YR 5/2) mottles; moderate very fine and fine subangular blocky structure; firm; continuous moderately thick dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) clay films on faces of peds; slightly acid; clear smooth boundary.

IIB22tg—20 to 27 inches; light olive brown (2.5Y 5/4) silty clay; few fine faint light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; firm; continuous moderately thick dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIB23tg—27 to 34 inches; light olive brown (2.5Y 5/4) silty clay; many coarse prominent gray (10YR 6/1) mottles; strong medium prismatic structure; firm; continuous moderately thick olive gray (5Y 4/2) clay films on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

IIB3t—34 to 41 inches; light olive brown (2.5Y 5/4) silty clay loam; many coarse prominent gray (10YR 6/1) mottles; strong medium prismatic structure; firm; common moderately thick dark gray (5Y 4/1) clay films on faces of peds; strong effervescence; mildly alkaline; clear wavy boundary.

IICg—41 to 60 inches; mottled gray (10YR 6/1) and light olive brown (2.5Y 5/4) silty clay loam; massive; very firm; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 45 inches. The thickness of the mollic epipedon ranges from 10 to 16 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The IIB2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silty clay loam or silty clay. The clay content ranges from 35 to 45 percent in the control section. The

IIB3 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6. It ranges from slightly acid to mildly alkaline. The IIC horizon is silty clay loam, clay loam, or silt loam. It is mildly alkaline or moderately alkaline.

Flanagan series

The Flanagan series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loess and in the underlying loamy glacial till. Slopes range from 0 to 3 percent.

Flanagan soils commonly are adjacent to Catlin, Dana, and Drummer soils. The moderately well drained Catlin and Dana soils are higher on the landscape than the Flanagan soils and contain less clay in the control section. Also, Dana soils have a thinner loess cap. The poorly drained Drummer soils are in drainageways and depressions below the Flanagan soils. They do not have an argillic B horizon. Their control section contains less clay than that of the Flanagan soils.

Typical pedon of Flanagan silt loam, 0 to 3 percent slopes, 1,405 feet north and 1,607 feet east of the southwest corner of sec. 19, T. 19 N., R. 9 E.

A11—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; slightly acid; gradual smooth boundary.

A12—8 to 15 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

A3—15 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

B21tg—18 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint brown (10YR 4/3) and very dark grayish brown (10YR 3/2) mottles; moderate fine subangular blocky structure; firm; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; clear smooth boundary.

B22tg—23 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint brown (10YR 5/3) and dark brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; clear smooth boundary.

B23tg—32 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

B31t—38 to 45 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and brown (10YR 5/3) silt loam; weak medium subangular blocky structure; friable; discontinuous thin very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; gradual smooth boundary.

IIB32t—45 to 49 inches; mottled yellowish brown (10YR 5/4), light olive brown (2.5Y 5/4), and light brownish gray (10YR 6/2) silt loam; weak coarse subangular blocky structure; firm; patchy thin dark grayish brown (10YR 4/2) clay films on faces of peds; about 5 percent pebbles; neutral; abrupt smooth boundary.

IIC—49 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 44 to 60 inches. The thickness of the overlying loess ranges from 40 to 60 inches. The depth to carbonates ranges from 44 to 58 inches. The thickness of the mollic epipedon ranges from 11 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam, but in some pedons the lower part is silty clay loam. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It ranges from medium acid to neutral. The clay content ranges from 35 to 42 percent in the control section. The IIB3 horizon has value of 4 to 6 and chroma of 1 to 6. It is silt loam, loam, clay loam, or silty clay loam. It ranges from slightly acid to mildly alkaline. The IIC horizon is loam, clay loam, silt loam, or silty clay loam. It is mildly alkaline or moderately alkaline.

Harpster series

The Harpster series consists of poorly drained, moderately permeable soils in depressions in outwash plains and till plains. These soils formed in calcareous, silty material over stratified sediments. Slopes range from 0 to 2 percent.

Harpster soils commonly are adjacent to Brenton and Elburn soils. Both of the adjacent soils are somewhat poorly drained and are on slight rises above the Harpster soils. They have a noncalcareous solum.

Typical pedon of Harpster silty clay loam, 1,000 feet north and 48 feet west of the southeast corner of sec. 18, T. 19 N., R. 8 E.

Apca—0 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine angular blocky structure parting to moderate fine granular; friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

B1gca—11 to 17 inches; dark gray (5Y 4/1) silty clay loam; few fine prominent yellowish brown (10YR

5/6) mottles; moderate medium subangular blocky structure; friable; many thin very dark gray (10YR 3/1) organic films on faces of peds; violent effervescence; moderately alkaline; clear smooth boundary.

B21g—17 to 28 inches; gray (5Y 5/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; few thin very dark gray (10YR 3/1) and dark gray (10YR 4/1) coatings on faces of peds; strong effervescence; moderately alkaline; clear smooth boundary.

B22g—28 to 37 inches; gray (5Y 5/1) silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; common thin dark gray (10YR 4/1) coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

B3g—37 to 41 inches; gray (5Y 6/1) silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few thin dark gray (10YR 4/1) coatings lining pores; slight effervescence; mildly alkaline; clear smooth boundary.

C1gca—41 to 49 inches; gray (5Y 6/1) stratified loam and silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2gca—49 to 60 inches; mottled gray (5Y 6/1) and yellowish brown (10YR 5/6) stratified loam and silt loam; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 25 to 45 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 0 or 1. It is silty clay loam or silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 2. It is silty clay loam in the upper part and silt loam, clay loam, or loam in the lower part. It is slightly to violently effervescent. The C horizon is stratified silt loam, loam, sandy loam, or clay loam.

Jasper series

The Jasper series consists of well drained, moderately permeable soils on till uplands, outwash plains, and stream terraces. These soils formed in stratified, loamy outwash. Slopes range from 1 to 10 percent.

The Jasper soils in this county have mottles with chroma of 2 in the lower part of the solum. This chroma is outside the defined range of the Jasper series. This difference, however, does not significantly affect the use or behavior of the soils.

Jasper soils commonly are adjacent to Brenton, Drummer, and La Hogue soils. The somewhat poorly drained Brenton soils and the poorly drained Drummer soils are lower on the landscape than the Jasper soils and contain less sand in the control section. Also, Drummer soils do not have an argillic B horizon. The somewhat poorly drained La Hogue soils are on foot slopes below the Jasper soils.

Typical pedon of Jasper loam, 1 to 5 percent slopes, 561 feet south and 400 feet west of the northeast corner of sec. 30, T. 20 N., R. 14 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

A3—9 to 12 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common moderately thick very dark grayish brown (10YR 3/2) organic coatings lining pores; medium acid; clear smooth boundary.

B21t—12 to 18 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct yellowish brown (10YR 5/6) and few medium faint brown (10YR 5/3) mottles; strong medium angular blocky structure; firm; many moderately thick dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—18 to 24 inches; yellowish brown (10YR 5/4) sandy clay loam; few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; strong medium angular blocky structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; few fine dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

B3—24 to 37 inches; brown (7.5YR 4/4) sandy loam; common medium distinct yellowish brown (10YR 5/8) mottles throughout and few fine distinct dark grayish brown (10YR 4/2) mottles in the lower part; weak medium angular blocky structure; friable; few thin dark brown (7.5YR 3/2) organic coatings lining pores; few fine dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

C—37 to 60 inches; mottled brown (10YR 5/3) and gray (10YR 6/1) stratified sandy loam, silt loam, and loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 48 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is loam, silt loam, or fine sandy loam. The B2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is clay loam or sandy clay loam. It ranges from slightly acid to strongly acid. The C horizon ranges from slightly acid to mildly alkaline.

Kendall series

The Kendall series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying stratified, loamy outwash. Slopes range from 0 to 3 percent.

Kendall soils commonly are adjacent to Camden, Drummer, and St. Charles soils. The well drained Camden soils are higher on the landscape than the Kendall soils. Also, they have a thinner loess cap. The poorly drained Drummer soils are in drainageways and depressions below the Kendall soils. They have a mollic epipedon and do not have an argillic B horizon. The moderately well drained St. Charles soils are higher on the landscape than the Kendall soils.

Typical pedon of Kendall silt loam, 0 to 3 percent slopes, 56 feet south and 1,560 feet west of the northeast corner of sec. 27, T. 17 N., R. 9 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; friable; thin grayish brown (10YR 5/2) lens of A2 material at 8 inches; slightly acid; abrupt smooth boundary.

A2—11 to 18 inches; grayish brown (10YR 5/2) silt loam; moderate medium platy structure; friable; many thin brown (10YR 5/3) coatings on faces of peds; neutral; clear smooth boundary.

B1t—18 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; many coarse prominent gray (5Y 6/1) and few fine faint yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; many thin yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B21tg—23 to 29 inches; mottled gray (5Y 6/1) and yellowish brown (10YR 5/6) silty clay loam; common fine faint yellowish brown (10YR 5/8) mottles; strong fine and medium subangular blocky structure; friable; common thin dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B22tg—29 to 41 inches; gray (5Y 6/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common thin dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B23t—41 to 50 inches; gray (5Y 6/1) loam; common coarse prominent strong brown (7.5YR 5/6) and few fine faint pale olive (5Y 6/4) mottles; weak coarse subangular blocky structure; friable; discontinuous thin brown (7.5YR 4/4) clay films on faces of peds; many thin irregular iron and manganese concretions; medium acid; gradual smooth boundary.

IICg—50 to 60 inches; mottled gray (5Y 6/1) and strong brown (7.5YR 5/6) stratified silt loam, loam, and sandy loam; massive; friable; few fine irregular iron and manganese concretions; slightly acid.

The thickness of the solum ranges from 45 to 70 inches. The thickness of the overlying silty material ranges from 40 to 60 inches.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. The A2 horizon has value of 4 to 7 and chroma of 2 or 3. The B1 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It ranges from strongly acid to slightly acid. The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. It ranges from very strongly acid to neutral. The clay content in the control section ranges from 27 to 35 percent. The IIB3 horizon is loam, clay loam, silt loam, or sandy loam. The IIC horizon is stratified silt loam, loam, sandy loam, sandy clay loam, or clay loam.

La Hogue series

The La Hogue series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loamy sediments and in the underlying loamy outwash. Slopes range from 0 to 3 percent.

La Hogue soils commonly are adjacent to Drummer, Jasper, and Proctor soils. The poorly drained Drummer soils are in drainageways and depressions below the La Hogue soils. They do not have an argillic B horizon. The well drained Jasper soils and the moderately well drained Proctor soils are higher on the landscape than the La Hogue soils. Also, Proctor soils contain more silt and less sand in the subsoil.

Typical pedon of La Hogue loam, 0 to 3 percent slopes, 1,910 feet north and 150 feet east of the southwest corner of sec. 7, T. 19 N., R. 14 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine angular blocky structure; friable; neutral; abrupt smooth boundary.

A12—10 to 16 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

B1t—16 to 26 inches; brown (10YR 4/3) clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak medium prismatic structure; friable; common thin very dark grayish brown (10YR 3/2) organic films and many thin dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

B2t—26 to 36 inches; brown (10YR 4/3) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; friable; many thin dark grayish brown (10YR 4/2) clay films on faces of

peds; few thin dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

B3t—36 to 43 inches; brown (10YR 4/3) sandy loam; common medium prominent reddish brown (5YR 4/4) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; patchy thin dark grayish brown (10YR 4/2) clay films on faces of peds; common medium irregular dark accumulations (iron and manganese oxide); neutral; gradual smooth boundary.

C1—43 to 54 inches; mottled grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) sandy loam; common medium distinct reddish brown (5YR 4/4) mottles; massive; very friable; common medium irregular dark accumulations (iron and manganese oxide); neutral; abrupt smooth boundary.

C2g—54 to 61 inches; gray (10YR 5/1) sandy loam; few medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; neutral; abrupt smooth boundary.

C3—61 to 65 inches; mottled light olive gray (5Y 6/2) and brownish yellow (10YR 6/6) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam, sandy loam, or silt loam. The B1 horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is loam, sandy clay loam, or clay loam. It ranges from medium acid to neutral. The B2t and B3 horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. The B2t horizon ranges from medium acid to neutral. It is sandy clay loam, loam, or clay loam. The clay content ranges from 18 to 35 percent in the control section. The B3 horizon is sandy loam or loamy sand and in some pedons has thin strata of loam or silt loam. It ranges from slightly acid to mildly alkaline. The C horizon is stratified loam, silt loam, sandy loam, loamy sand, or sand and fine gravel. It is slightly acid or neutral.

Martinsville series

The Martinsville series consists of well drained, moderately permeable soils on stream terraces and outwash plains. These soils formed in a thin layer of loess and in the underlying stratified, loamy glacial outwash. Slopes range from 2 to 18 percent.

Martinsville soils commonly are adjacent to Colo, Drummer, and Kendall soils. All of the adjacent soils are lower on the landscape than the Martinsville soils. Also, they have a lower content of sand in the control section. The poorly drained Colo soils are on alluvial bottom land. They have a mollic epipedon and do not have an argillic B horizon. The poorly drained Drummer soils are in drainageways and depressions. They do not have an argillic B horizon. Kendall soils are somewhat poorly drained.

Typical pedon of Martinsville silt loam, 2 to 5 percent slopes, 200 feet north and 2,440 feet west of the center of sec. 36, T. 21 N., R. 7 E.

Ap—0 to 6 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

A2—6 to 9 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium platy structure parting to moderate medium subangular blocky; friable; silt coatings on faces of peds, light gray (10YR 7/1) dry; few thin dark grayish brown (10YR 4/2) films on faces of peds; neutral; abrupt smooth boundary.

B21t—9 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; common fine accumulations (iron and manganese oxide); neutral; clear smooth boundary.

IIB22t—18 to 33 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; common thin accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIB23t—33 to 42 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse prismatic structure parting to weak subangular blocky; friable; few thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB3t—42 to 50 inches; yellowish brown (10YR 5/4) stratified silt loam and loam; weak coarse prismatic structure; friable; very few thin brown (10YR 4/3) clay films lining pores; medium acid; clear smooth boundary.

IIC—50 to 72 inches; mottled yellowish brown (10YR 5/4) and dark grayish brown (10YR 4/2) stratified silt loam, loam, and sandy clay loam; massive; friable; slightly acid.

The thickness of the solum ranges from 36 to 60 inches. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam. The B2 and IIB horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The B2 and IIB2 horizons are clay loam, loam, sandy clay loam, silty clay loam, or sandy loam. They range from strongly acid to neutral. The clay content ranges from 20 to 35 percent in the control section. The IIB3 horizon ranges from medium acid to mildly alkaline. The IIC horizon is stratified sand, silt loam, sandy clay loam, or loam.

Miami series

The Miami series consists of well drained soils that are moderately permeable in the solum and moderately slowly permeable in the underlying material. These soils are on uplands. They formed in a thin layer of loess and in the underlying loam glacial till. Slopes range from 2 to 25 percent.

Miami soils commonly are adjacent to Ambraw, Colo, Drummer, and Xenia soils. The poorly drained Ambraw and Colo soils are on alluvial bottom land below the Miami soils. The poorly drained Drummer soils are in drainageways and depressions below the Miami soils. They do not have an argillic B horizon. The moderately well drained Xenia soils generally are lower on the landscape than the Miami soils. Also, they formed in a thicker layer of loess and in the underlying loam glacial till.

Typical pedon of Miami silt loam, 5 to 10 percent slopes, eroded, 50 feet south and 600 feet east of the center of sec. 31, T. 21 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium platy structure parting to moderate medium subangular blocky; friable; silt coatings on faces of peds, light gray (10YR 7/2) dry; neutral; abrupt smooth boundary.

IIB21t—8 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular blocky structure; friable; continuous thin brown (10YR 4/3) clay films on faces of peds; silt coatings on faces of peds, light gray (10YR 7/2) dry; medium acid; clear smooth boundary.

IIB22t—15 to 24 inches; brown (10YR 5/3) clay loam; moderate medium angular blocky structure; firm; continuous moderately thick brown (10YR 4/3) clay films on faces of peds; common fine yellowish brown (10YR 5/6) and few fine yellowish red (5YR 4/6) iron accumulations; medium acid; clear smooth boundary.

IIB3t—24 to 31 inches; brown (10YR 5/3) loam; moderate medium prismatic structure; friable; discontinuous thin brown (10YR 4/3) clay films lining pores; common medium irregular yellowish brown (10YR 5/8) iron accumulations; slight effervescence; mildly alkaline; clear smooth boundary.

IIC1—31 to 36 inches; light olive brown (2.5Y 5/4) loam; massive; friable; few thin brown (10YR 4/3) clay films lining pores; slight effervescence; mildly alkaline; clear smooth boundary.

IIC2—36 to 60 inches; light yellowish brown (2.5Y 6/4) loam; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 42 inches. The Ap horizon has value of 4 or 5 and chroma of 1 to 3. It is loam or silt loam. Some pedons have an A2 horizon. This horizon has value of 4 to 6 and chroma of 2 to 4. It is silt loam or loam. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam, loam, sandy clay loam, or silty clay loam. It ranges from medium acid to neutral. The clay content ranges from 25 to 35 percent in the control section. The IIB3 horizon ranges from neutral to moderately alkaline.

Millbrook series

The Millbrook series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying loamy outwash. Slopes range from 0 to 2 percent.

Millbrook soils commonly are adjacent to Camden, Drummer, and Proctor soils. The well drained Camden and moderately well drained Proctor soils are higher on the landscape than the Millbrook soils. Also, Proctor soils have a mollic epipedon. The poorly drained Drummer soils are in drainageways and depressions below the Millbrook soils. They have a mollic epipedon and do not have an argillic B horizon.

Typical pedon of Millbrook silt loam, 55 feet north and 2,240 feet west of the southeast corner of sec. 36, T. 17 N., R. 9 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium platy structure parting to moderate fine and medium granular; friable; neutral; abrupt smooth boundary.

A2—7 to 14 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; many fine faint brown (10YR 4/3) and few distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate medium granular; friable; many thin very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

B21t—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and many medium distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few fine dark gray (10YR 4/1) clay films lining pores; few medium irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

B22t—21 to 35 inches; mottled silty clay loam, 70 percent gray (10YR 5/1) and 30 percent yellowish brown (10YR 5/6); weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine dark gray (20YR 4/1) clay films lining pores; common medium irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

IIB23t—35 to 44 inches; gray (10YR 5/1) clay loam; many coarse distinct yellowish brown (10YR 5/6)

mottles; moderate medium prismatic structure; friable; few fine dark gray (10YR 4/1) and very dark gray (10YR 3/1) clay films lining pores; few medium irregular dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIB3—44 to 55 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/4) stratified clay loam and sandy loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; neutral; clear smooth boundary.

IIC—55 to 60 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/4) stratified sandy loam that has thin lenses of coarse sand; massive; very friable; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the overlying silty material ranges from 22 to 40 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The A2 horizon has value of 4 to 6. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 6. It ranges from strongly acid to neutral. The content of clay in the control section ranges from 27 to 35 percent. The IIB2t and IIB3 horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 8. They are clay loam, sandy clay loam, loam, sandy loam, sand, or silt loam. The IIB2t horizon ranges from medium acid to mildly alkaline. The IIC horizon is stratified silt loam, loam, sandy loam, clay loam, loamy sand, or sand.

Mona series

The Mona series consists of moderately well drained, moderately slowly permeable soils on upland ridges and knolls. These soils formed in loess and loamy glacial debris and in the underlying clayey glacial till (fig. 17). Slopes range from 2 to 7 percent.

Mona soils commonly are adjacent to Bryce and Swygert soils. The control section of both of the adjacent soils contains more clay than that of the Mona soils. The poorly drained Bryce soils are in drainageways and depressions below the Mona soils. The somewhat poorly drained Swygert soils generally are lower on the landscape than the Mona soils.

Typical pedon of Mona silt loam, 2 to 7 percent slopes, 650 feet north and 30 feet east of the southwest corner of sec. 9, T. 22 N., R. 9 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A3—10 to 15 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; continuous moderately thick very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

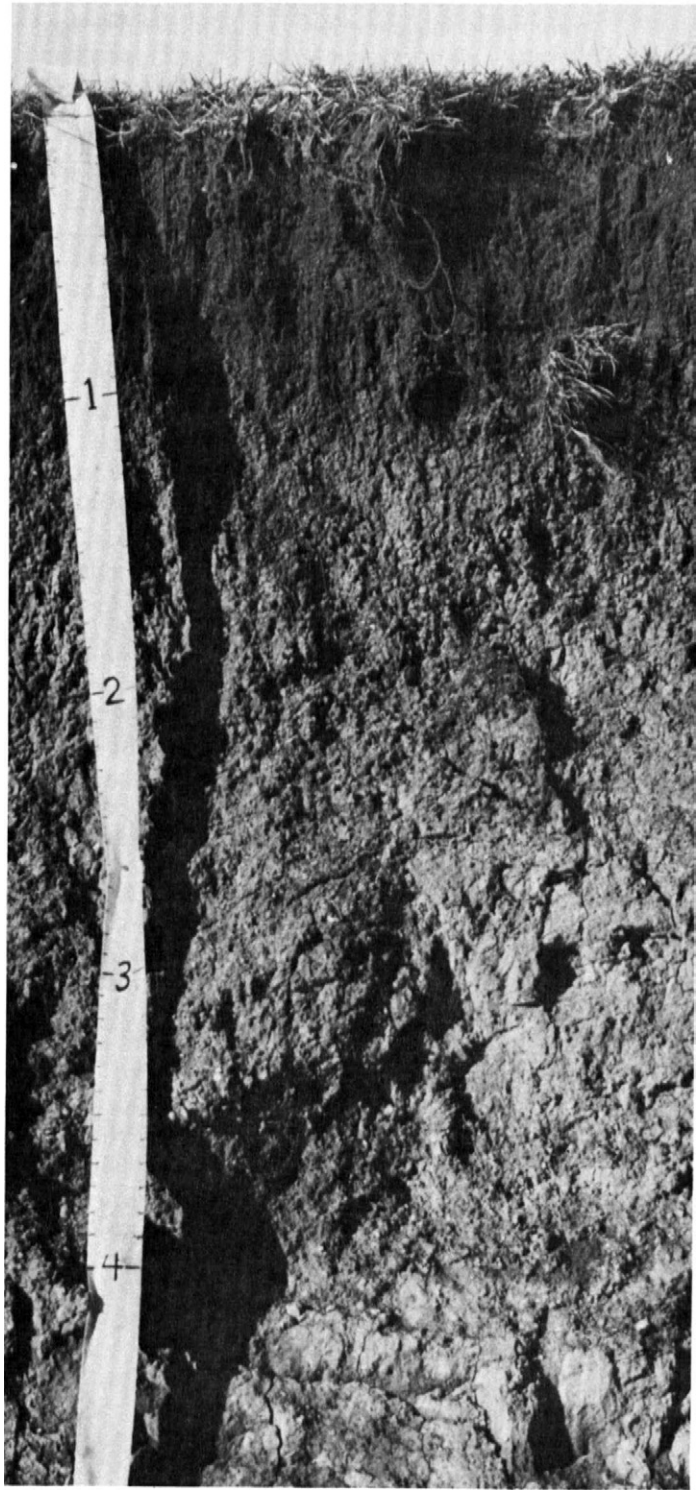

Figure 17.—Profile of Mona silt loam. Dense clayey till is at a depth of about 4 feet.

B21t—15 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common thin very dark grayish brown (10YR 3/2) organic films on faces of peds; many thin brown (10YR 4/3) clay films on faces of peds; slightly acid; abrupt smooth boundary.
IIB22t—24 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; few coarse distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable; many thin dark grayish brown (10YR 4/2) clay films on faces of peds; common thin dark yellowish brown (10YR 3/4) clay films lining pores; neutral; clear smooth boundary.
IIB23t—35 to 44 inches; dark yellowish brown (10YR 4/4) sandy clay loam; few coarse distinct brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; friable; many thin dark brown (10YR 3/3) clay films on faces of peds; neutral; abrupt smooth boundary.
IIIB3t—44 to 53 inches; light olive brown (2.5Y 5/4) silty clay; moderate medium prismatic structure; firm; many thin dark grayish brown (2.5Y 4/2) clay films on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.
IIIC—53 to 60 inches; light olive brown (2.5Y 5/4) silty clay; few medium distinct light brownish gray (2.5Y 6/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 36 to 54 inches. The depth to carbonates ranges from 30 to 50 inches. The thickness of the overlying silty material ranges from 10 to 24 inches. The thickness of the mollic epipedon ranges from 10 to 15 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The B and IIB horizons have value of 4 to 6 and chroma of 3 or 4. They range from medium acid to neutral. The content of clay in the control section ranges from 27 to 35 percent. The IIIB horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 3 or 4. The IIIB and IIIC horizons are silty clay or clay. They are mildly alkaline or moderately alkaline.

Morley series

The Morley series consists of moderately well drained, slowly permeable or moderately slowly permeable soils on till plains. These soils formed in a thin layer of loess and in the underlying silty clay loam glacial till. Slopes range from 2 to 20 percent.

Morley soils commonly are adjacent to Ashkum, Blount, and Colo soils. The poorly drained Ashkum soils are in drainageways below the Morley soils. They have a mollic epipedon and do not have an argillic B horizon. The somewhat poorly drained Blount soils are lower on the landscape than the Morley soils. The poorly drained Colo soils are on alluvial bottom land below the Morley soils.

Typical pedon of Morley silt loam, 5 to 12 percent slopes, eroded, 1,040 feet south and 2,330 feet west of the northeast corner of sec. 8, T. 22 N., R. 14 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.
B21t—6 to 10 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; many moderately thick yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear smooth boundary.
B22t—10 to 20 inches; light olive brown (2.5Y 5/4) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; many moderately thick light olive brown (2.5Y 5/4) clay films on faces of peds; medium acid; clear smooth boundary.
B3t—20 to 34 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) mottles; moderate coarse angular blocky structure; firm; many moderately thick dark grayish brown (2.5Y 4/2) clay films on faces of peds; mildly alkaline; gradual smooth boundary.
C—34 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; massive; very firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 48 inches. The depth to free carbonates ranges from 12 to 45 inches.

The Ap horizon has value of 2 to 4 and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam, clay loam, silty clay, or clay. The clay content ranges from 35 to 50 percent in the control section. The B3 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam or silty clay. It ranges from slightly acid to moderately alkaline. The C horizon is silty clay loam or clay loam.

Morley silt loam, 2 to 5 percent slopes, has mottles with chroma of 2 closer to the surface than is defined as the range for the Morley series. This difference, however, does not significantly affect the use or behavior of the soil.

Muskego series

The Muskego series consists of very poorly drained soils in slight depressions in stream terraces. These soils formed in silty overwash material and in the underlying organic sediments and coprogenous earth. Permeability is moderate or moderately rapid in the upper part of the

profile and slow in the lower part. Slopes range from 0 to 2 percent.

Muskego soils commonly are adjacent to Colo and Peotone soils. The poorly drained Colo soils formed in medium textured alluvial sediments on bottom land. Peotone soils are cumulic and have a fine textured mineral B2 horizon.

Typical pedon of Muskego silty clay loam, overwash, 1 foot south and 1 foot west of the northeast corner of sec. 18, T. 22 N., R. 14 W.

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct brown (10YR 4/3) and few fine prominent reddish brown (5YR 4/3) mottles; massive; firm; slightly acid; clear smooth boundary.

A12—11 to 16 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; few fine prominent dark reddish brown (2.5Y 3/4) mottles; weak medium platy structure parting to moderate fine subangular blocky; friable; few thin dark reddish brown (5YR 3/4) roots; slightly acid; clear smooth boundary.

Oa1—16 to 23 inches; black (N 2/0) sapric material; few fine distinct dark yellowish brown (10YR 3/4) mottles; about 4 percent fiber, 1 percent rubbed; moderate medium subangular blocky structure; friable; few thin dark reddish brown (5YR 3/4) roots; slightly acid; abrupt smooth boundary.

Oa2—23 to 31 inches; black (N 2/0) sapric material; few fine prominent reddish brown (5YR 4/4) mottles; about 6 percent fiber, 1 percent rubbed; weak medium subangular blocky structure; friable; common dark reddish brown (2.5YR 3/4) roots; slightly acid; abrupt smooth boundary.

Oa3—31 to 50 inches; mottled black (10YR 2/1) and very dark grayish brown (10YR 3/2) sapric material; about 30 percent fiber, 4 percent rubbed; weak medium platy structure; friable; neutral; abrupt smooth boundary.

Lco—50 to 70 inches; mottled black (5Y 2/2) and olive gray (5Y 4/2) coprogenous earth; massive; friable; slight effervescence; mildly alkaline.

The A horizon ranges from 8 to 16 inches in thickness and the sapric material from 12 to 36 inches. The depth to coprogenous earth ranges from 25 to 51 inches. Some pedons have fragments of twigs, branches, or logs. These fragments make up less than 10 percent of the volume.

The O horizon has value of 2 or 3 and chroma of 0 to 2. It is dominantly sapric material, but the content of hemic material is as much as 25 percent in some pedons. The Lco horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 to 5, and chroma of 1 to 3. It ranges from slightly acid to mildly alkaline.

Ockley series

The Ockley series consists of well drained soils on stream terraces. These soils formed in a thin layer of loess and in loamy outwash over sand and gravel. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 1 to 12 percent.

Ockley soils commonly are adjacent to Blount and Colo soils. The somewhat poorly drained Blount soils are in positions on the landscape similar to those of the Ockley soils. They have a fine textured B horizon. The poorly drained Colo soils are on bottom land below the Ockley soils. They are cumulic and do not have an argillic B horizon.

Typical pedon of Ockley silt loam, 1 to 5 percent slopes, 2,490 feet south and 80 feet east of the northwest corner of sec. 6, T. 22 N., R. 14 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak thick platy structure parting to moderate fine granular; friable; few thin brown (10YR 5/3) silt coatings on faces of peds; slightly acid; abrupt smooth boundary.

B1t—10 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; continuous moderately thick brown (10YR 4/3) clay films; few thin very dark gray (10YR 3/1) organic films on faces of peds; medium acid; clear smooth boundary.

IIB21t—19 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to moderate medium angular blocky; firm; continuous moderately thick brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB22t—24 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate coarse prismatic structure; firm; many moderately thick brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB23t—35 to 45 inches; mottled brown (10YR 4/3) and dark yellowish brown (10YR 4/4) gravelly clay loam; common medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium subangular blocky structure; friable; common moderately thick dark brown (10YR 3/3) clay films on faces of peds; neutral; clear smooth boundary.

IIIC1—45 to 53 inches; brown (10YR 4/3) gravelly loamy sand; massive; very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

IIIC2—53 to 60 inches; brown (10YR 5/3) sand and gravel; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The depth to free carbonates ranges from 32 to 60 inches.

The Ap horizon is silt loam, loam, or clay loam. The IIB2 horizon has hue of 10YR, 2.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam or silty clay loam but is gravelly clay loam or gravelly sandy clay loam in the lower part. The clay content ranges from 20 to 35 percent in the control section. The C horizon is mildly alkaline or moderately alkaline.

Odell series

The Odell series consists of somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in loamy and silty glacial till. Slopes range from 0 to 3 percent.

Odell soils commonly are adjacent to Dana, Drummer, and Parr soils. The moderately well drained Dana and well drained Parr soils are higher on the landscape than the Odell soils. Also, Dana soils contain less sand in the control section. The poorly drained Drummer soils are in slight depressions and drainageways below the Odell soils. They do not have an argillic B horizon, and they formed in loess and in loamy glacial outwash.

Typical pedon of Odell silt loam, 0 to 3 percent slopes, 35 feet north and 1,240 feet west of the center of sec. 4, T. 21 N., R. 14 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine and medium angular blocky structure; friable; common brown (10YR 4/3) flecks of B material on some peds; neutral; abrupt smooth boundary.

B21t—11 to 16 inches; brown (10YR 4/3) silty clay loam; very few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; friable; many moderately thick very dark gray (10YR 3/1) and many thin dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIB22t—16 to 21 inches; light olive brown (2.5Y 5/4) clay loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; few thin very dark gray (10YR 3/1) and common thin dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIB3t—21 to 26 inches; light olive brown (2.5Y 5/4) clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few thin dark grayish brown (10YR 4/2) clay films on faces of peds; few fine iron accumulations; neutral; clear smooth boundary.

IIC—26 to 60 inches; light olive brown (2.5Y 5/4) loam; common fine distinct gray (N 6/0) and few fine prominent brownish yellow (10YR 6/8) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 42 inches. The thickness of the overlying silty material ranges from 0 to 25 inches. The depth to free carbonates ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or loam. The B2 and IIBt horizons have value of 4 to 6 and chroma of 3 or 4. The IIBt and C horizons are loam or clay loam.

Onarga series

The Onarga series consists of well drained soils on outwash plains. These soils formed in windblown and water-sorted loamy and sandy material. Permeability is moderately rapid in the solum and rapid in the underlying material. Slopes range from 1 to 5 percent.

Onarga soils commonly are adjacent to Drummer, La Hogue, and Proctor soils. All of the adjacent soils contain less sand and more clay in the control section than the Onarga soils. The poorly drained Drummer soils are in drainageways and depressions below the Onarga soils. The somewhat poorly drained La Hogue soils also are lower on the landscape. The moderately well drained Proctor soils are on outwash plains and stream terraces.

Typical pedon of Onarga sandy loam, 1 to 5 percent slopes, 840 feet south and 2,588 feet west of the northeast corner of sec. 17, T. 19 N., R. 14 W.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak thin platy structure parting to moderate fine granular; very friable; neutral; abrupt smooth boundary.

B1—12 to 16 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; very friable; many thin very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

B21t—16 to 25 inches; brown (10YR 4/3) sandy clay loam; few medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; common thin very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

B22t—25 to 37 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common thin brown (10YR 4/3) clay films bridging sand grains; few thin very dark gray (10YR 3/1) organic films lining root channels; neutral; gradual smooth boundary.

B3—37 to 49 inches; brown (10YR 5/3) sandy loam; weak medium subangular blocky structure; very friable; few thin brown (10YR 4/3) clay films bridging sand grains; slightly acid; clear smooth boundary.

C—49 to 65 inches; yellowish brown (10YR 5/4) sand; bands of brown (7.5YR 4/4) loamy sand 1 to 2 inches thick; massive in lamellae and single grain between; very friable in lamellae and loose between; medium acid.

The thickness of the solum ranges from 36 to 50 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The B horizon is medium acid to neutral. The B1 horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. It is sandy loam or sandy clay loam. The B2t and B3 horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The B2t horizon is loam, sandy loam, or sandy clay loam. The clay content ranges from 15 to 18 percent in the control section. The B3 horizon is sandy loam or loamy sand. The C horizon is stratified sandy loam, loamy sand, sand, loam, or silt loam.

Parr series

The Parr series consists of well drained, moderately permeable soils on moraines and till plains. These soils formed in a thin mantle of loess and in the underlying calcareous loam glacial till. Slopes range from 2 to 15 percent.

Parr soils commonly are adjacent to Drummer, Odell, and Raub soils. The poorly drained Drummer soils are in drainageways and depressions below the Parr soils. They formed in loess and in the underlying loamy outwash, and they do not have an argillic B horizon. The somewhat poorly drained Odell and Raub soils are lower on the landscape than the Parr soils. Also, Raub soils contain less sand in the control section.

Typical pedon of Parr silt loam, 2 to 5 percent slopes, 225 feet south and 1,320 feet east of the northwest corner of sec. 31, T. 22 N., R. 14 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak thin platy structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

B21t—10 to 14 inches; brown (10YR 4/3) clay loam; moderate fine subangular blocky structure; firm; continuous thin very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—14 to 27 inches; light olive brown (2.5Y 5/4) clay loam; moderate medium subangular blocky structure; firm; common thin very dark grayish brown (10YR 3/2) clay films on faces of peds; few strong brown (7.5YR 5/8) iron accumulations; slightly acid; clear smooth boundary.

B3—27 to 31 inches; light olive brown (2.5Y 5/4) loam; weak medium subangular blocky structure; friable; mildly alkaline; gradual smooth boundary.

C—31 to 60 inches; light olive brown (2.5Y 5/4) loam; few coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; common light gray (10YR 7/1) secondary lime accumulations; moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam, clay loam, or loam. The B2t horizon has value of 3 to 5 and chroma of 3 to 6. It is clay loam or loam. It is medium acid to slightly acid. The C horizon is mildly alkaline or moderately alkaline.

Parr clay loam, 10 to 15 percent slopes, severely eroded, has a thinner surface layer and solum than is defined as the range for the Parr series. This difference, however, does not significantly affect the use or behavior of the soil.

Pella series

The Pella series consists of poorly drained, moderately permeable soils on outwash plains and till plains. These soils formed in loess and in the underlying loamy sediments. Slopes range from 0 to 2 percent.

Pella soils commonly are adjacent to Catlin, Elburn, and Flanagan soils. All of the adjacent soils have an argillic B horizon. They are higher on the landscape than the Pella soils. The moderately well drained Catlin soils formed in loess and in loam glacial till. The somewhat poorly drained Elburn soils do not have carbonates within a depth of 40 inches. The somewhat poorly drained Flanagan soils formed in loess and in loam glacial till. They have a fine textured B horizon.

Typical pedon of Pella silty clay loam, 800 feet north and 20 feet east of the southwest corner of sec. 28, T. 17 N., R. 7 E.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

A3—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine angular blocky structure; firm; many moderately thick black (10YR 2/1) organic coatings on faces of peds; mildly alkaline; clear smooth boundary.

B2g—15 to 21 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4 and 5/8) mottles; strong fine prismatic structure; firm; many thin dark gray (10YR 4/1) clay films on faces of peds; common moderately thick very dark gray (10YR 3/1) organic coatings lining pores; mildly alkaline; abrupt smooth boundary.

B31g—21 to 26 inches; light brownish gray (2.5Y 6/2) silt loam; common coarse distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure; friable;

common thin dark gray (10YR 4/1) clay films lining pores; common medium rounded lime concretions; strong effervescence; moderately alkaline; clear smooth boundary.

IIB32g—26 to 34 inches; gray (5Y 6/1) silt loam that has noticeable sand; few medium prominent brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; friable; common thin gray (10YR 5/1) clay films on faces of peds; strong effervescence; moderately alkaline; clear smooth boundary.

IICg—34 to 60 inches; gray (5Y 6/1) stratified silt loam and loamy sand; few medium prominent brownish yellow (10YR 6/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the overlying silty material ranges from 24 to 40 inches. The depth to free carbonates ranges from 20 to 40 inches. The mollic epipedon ranges from 12 to 24 inches in thickness.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is typically silty clay loam but is silt loam in some pedons. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The IIB3 horizon has hue of 5Y, 2.5Y, or 10YR, value of 5 or 6, and chroma of 1 to 8. It is silt loam, loam, sandy loam, or silty clay loam. The IIB3 and IIC horizons are mildly alkaline or moderately alkaline.

Peotone series

The Peotone series consists of very poorly drained, moderately slowly permeable soils in depressions in outwash plains and till plains. These soils formed in outwash and in the underlying silty clay loam sediments. Slopes range from 0 to 2 percent.

Peotone soils commonly are adjacent to Brenton, Elliott, Parr, and Varna soils. All of the adjacent soils are better drained than the Peotone soils and are higher on the landscape. Also, their mollic epipedon is less than 24 inches thick.

Typical pedon of Peotone silty clay loam, 105 feet north and 638 feet west of the southeast corner of sec. 7, T. 22 N., R. 9 E.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium angular blocky structure; firm; neutral; abrupt smooth boundary.

A12—10 to 24 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine prismatic structure; very firm; neutral; clear smooth boundary.

A3g—24 to 32 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; common medium distinct dark gray (5Y 4/1) and gray (5Y 5/1) mottles; weak medium prismatic structure; firm; neutral; clear smooth boundary.

B2g—32 to 46 inches; dark gray (5Y 4/1) silty clay loam; common medium faint gray (5Y 5/1) mottles; weak medium prismatic structure; firm; continuous moderately thick very dark gray (10YR 3/1) organic films on faces of peds; mildly alkaline; clear smooth boundary.

B3g—46 to 60 inches; gray (5Y 5/1) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; firm; common moderately thick very dark gray (10YR 3/1) clay films on faces of peds; common thin dark gray (10YR 4/1) films on faces of peds; mildly alkaline; gradual smooth boundary.

Cg—60 to 70 inches; gray (5Y 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 2. It ranges from slightly acid to mildly alkaline. The clay content in the 10- to 40-inch control section ranges from 35 to 42 percent. The B3 horizon has value of 5 or 6 and chroma of 0 or 1. It is neutral or mildly alkaline. The C horizon ranges from neutral to moderately alkaline.

Plano series

The Plano series consists of moderately well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy outwash. Slopes range from 1 to 5 percent.

Plano soils commonly are adjacent to Drummer and Elburn soils. The poorly drained Drummer soils are in slight depressions and drainageways below the Plano soils. They do not have an argillic B horizon. The somewhat poorly drained Elburn soils are lower on the landscape than the Plano soils.

Typical pedon of Plano silt loam, 1 to 5 percent slopes, 450 feet west and 25 feet north of the southeast corner of sec. 19, T. 21 N., R. 7 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A12—10 to 16 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; moderate medium platy structure parting to moderate medium granular; friable; many thin very dark grayish brown (10YR

3/2) organic films on faces of peds; neutral; clear smooth boundary.

B1—16 to 20 inches; brown (10YR 4/3) silty clay loam; weak very fine subangular blocky structure; friable; many thin dark brown (10YR 3/3) organic films on faces of peds; slightly acid; clear smooth boundary.

B21t—20 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—24 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; few fine irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

B23t—34 to 47 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium and coarse prismatic structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; few fine irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

IIB3t—47 to 62 inches; yellowish brown (10YR 5/4) stratified silt loam and loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; patchy thin brown (10YR 4/3) and grayish brown (10YR 5/2) clay films lining pores and on faces of peds; few fine irregular dark accumulations (iron and manganese oxide); slightly acid; gradual smooth boundary.

IIC—62 to 70 inches; light olive brown (2.5Y 5/4) stratified silt loam, loam, and sandy loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; friable; few fine irregular dark accumulations (iron and manganese oxide); neutral.

The thickness of the solum ranges from 44 to 70 inches. The thickness of the overlying silty material is 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The B2t horizon has value of 4 or 5 and chroma of 3 or 4. It ranges from strongly acid to neutral. The IIB3 horizon is stratified silt loam, loam, or sandy clay loam. It ranges from medium acid to mildly alkaline.

Proctor series

The Proctor series consists of moderately well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy outwash. Slopes range from 1 to 5 percent.

Proctor soils commonly are adjacent to Brenton, Drummer, and Elburn soils. The somewhat poorly drained Brenton and Elburn soils are lower on the landscape than the Proctor soils. Also, Elburn soils formed in more than 40 inches of loess. The poorly drained Drummer soils are in drainageways and slight depressions below the Proctor soils. They do not have an argillic B horizon.

Typical pedon of Proctor silt loam, 1 to 5 percent slopes, 66 feet south and 1,700 feet west of the northeast corner of sec. 34, T. 19 N., R. 9 E.

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

A3—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

B21t—14 to 19 inches; brown (10YR 4/3) silty clay loam; moderate medium and fine subangular blocky structure; firm; continuous moderately thick dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—19 to 27 inches; brown (10YR 4/3) silty clay loam; moderate medium and fine subangular blocky structure; firm; discontinuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—27 to 36 inches; brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and common fine and medium faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; discontinuous dark brown (10YR 3/3) clay films on faces of peds; few dark accumulations (iron and manganese oxide); slightly acid; abrupt smooth boundary.

IIB24t—36 to 44 inches; brown (10YR 4/3) clay loam; many medium faint grayish brown (10YR 5/2) and brown (10YR 5/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; discontinuous dark brown (10YR 3/3) clay films on faces of peds; many dark accumulations (iron and manganese oxide); slightly acid; abrupt smooth boundary.

IIB3—44 to 50 inches; light olive brown (2.5Y 5/4) and olive brown (2.5Y 4/4) stratified loam and sandy loam; few fine faint grayish brown (2.5Y 5/2) mottles; weak medium angular and subangular blocky structure; friable; discontinuous brown (10YR 4/3) clay films lining pores; many dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIC—50 to 66 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) stratified loam and sandy loam; massive; friable; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the overlying silty material ranges from 28 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 16 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The IIB2 horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam, loam, or silty clay loam. The B2 and IIB2 horizons range from medium acid to neutral. The IIB3 horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is stratified loam, sandy loam, clay loam, silt loam, or sand. The IIC horizon is stratified sandy loam, loam, loamy sand, or silt loam. It is slightly acid or neutral.

Raub series

The Raub series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loess and in the underlying calcareous loam till. Slopes range from 0 to 3 percent.

Raub soils commonly are adjacent to Dana, Drummer, and Parr soils. The moderately well drained Dana and well drained Parr soils are higher on the landscape than the Raub soils. Also, Parr soils contain more sand in the control section. The poorly drained Drummer soils are in depressions and drainageways below the Raub soils. They do not have an argillic B horizon, and they formed in loess and in stratified, loamy outwash.

Typical pedon of Raub silt loam, 0 to 3 percent slopes, 1,690 feet east and 2,550 feet north of the southwest corner of sec. 19, T. 20 N., R. 14 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A12—10 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—18 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine subangular blocky structure; friable; few moderately thick very dark gray (10YR 3/1) organic films lining pores; many moderately thick dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; abrupt smooth boundary.

B22t—22 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint dark grayish brown (10YR 4/2) and brown (10YR 5/3) and common fine distinct yellowish brown (10YR 5/6) mottles; strong fine and medium angular blocky structure; firm; many moderately thick brown (10YR 4/3) clay films on faces of peds; few fine dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

IIB23t—32 to 40 inches; yellowish brown (10YR 5/4) clay loam; many fine faint yellowish brown (10YR 5/6) and few coarse distinct light olive gray (5Y 6/2) mottles; weak medium subangular blocky structure; firm; common thin black (10YR 2/1) clay films in root channels; many medium dark accumulations (iron and manganese oxide); few quartz pebbles; neutral; clear smooth boundary.

IIB3—40 to 50 inches; yellowish brown (10YR 5/4) clay loam; many medium faint yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; weak medium and coarse subangular blocky structure; firm; common fine dark accumulations (iron and manganese oxide); few dolomite pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

IIC—50 to 60 inches; mottled yellowish brown (10YR 5/4) and gray (5Y 6/1) loam; common fine and distinct yellowish brown (10YR 5/6) mottles; massive; firm; common dolomite pebbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 36 to 70 inches. The thickness of the overlying loess ranges from 22 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2 and IIB horizons have hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 to 6. The B2 horizon is medium acid or slightly acid. The IIB horizon is neutral or mildly alkaline. It is clay loam or silty clay loam. The clay content ranges from 27 to 35 percent in the control section. The IIC horizon is loam or clay loam. It is mildly alkaline or moderately alkaline.

Ross series

The Ross series consists of well drained, moderately permeable soils on flood plains and low stream terraces. These soils formed in stratified loamy sediments. Slopes range from 0 to 2 percent.

The Ross soils in this county have a thinner mollic epipedon than is defined as the range for the Ross series. Also, they have a thicker solum. These differences, however, do not significantly affect the use or behavior of the soils.

Ross soils commonly are adjacent to Ambraw and Colo soils. Both of the adjacent soils are poorly drained and are on alluvial bottom land below the Ross soils. Also, the control section of Colo soils contains less sand than that of the Ross soils.

Typical pedon of Ross silt loam, 1,790 feet north and 225 feet west of the southeast corner of sec. 22, T. 21 N., R. 7 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; clear smooth boundary.
A12—10 to 21 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; common medium brown (10YR 4/3) flecks of B material; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.
B1—21 to 31 inches; brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; few thin very dark gray (10YR 3/1) organic films lining pores; many thin very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.
B2—31 to 55 inches; brown (10YR 4/3) loam; weak medium prismatic structure; friable; common thin dark grayish brown (10YR 4/2) films on faces of peds; neutral; gradual smooth boundary.
C—55 to 63 inches; brown (10YR 4/3) loam; massive; friable; neutral.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam, loam, or silty clay loam. The B horizon has value of 4 or 5 and chroma of 2 to 4. It is loam, sandy loam, silty clay loam, or silt loam. It ranges from slightly acid to moderately alkaline. The C horizon also ranges from slightly acid to moderately alkaline. It is loam, sandy loam, silt loam, or sandy clay loam.

Russell series

The Russell series consists of well drained, moderately permeable soils on till plains. These soils formed in loess and in the underlying calcareous loam till. Slopes range from 4 to 11 percent.

Russell soils commonly are adjacent to Drummer, Sabina, and Sunbury soils. The poorly drained Drummer soils formed in loess and stratified, loamy outwash in drainageways and depressions below the Russell soils. They have a mollic epipedon. The somewhat poorly drained Sabina and Sunbury soils are lower on the landscape than the Russell soils. They have a fine textured subsoil. Also, Sunbury soils have a mollic surface layer.

Typical pedon of Russell silt loam, 4 to 11 percent slopes, eroded, 2,200 feet south and 975 feet east of the northwest corner of sec. 12, T. 20 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure parting to moderate medium granular; friable; medium acid; abrupt smooth boundary.
A2—8 to 11 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure parting to moderate medium subangular blocky; friable; common thin dark grayish brown (10YR 4/2) coatings on faces of peds; medium acid; abrupt smooth boundary.
B1t—11 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common thin light gray (10YR 7/2) silt coatings on faces of peds; continuous thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.
B21t—18 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6 and 5/8) and common medium distinct pale brown (10YR 6/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.
IIB22t—29 to 43 inches; light olive brown (2.5Y 5/4) clay loam; common fine distinct olive (5Y 5/3) and common medium distinct light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure; firm; common moderately dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.
IIB3t—43 to 51 inches; mottled light olive brown (2.5Y 5/4) and olive (5Y 5/3) clay loam; common medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure; firm; common moderately thick very dark gray (10YR 3/1) clay films lining pores; neutral; clear smooth boundary.
IIC—51 to 72 inches; mottled light olive brown (2.5Y 5/4 and 5/6) and olive (5Y 5/3) loam; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 40 to 70 inches. The thickness of the overlying loess ranges from 22 to 40 inches.

The A horizon has value of 4 or 5 and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It ranges from medium acid to very strongly acid. It is silt loam or silty clay loam. The clay content ranges from 23 to 33 percent in the control section. The IIBt horizon is clay loam or loam. The IIC horizon is mildly alkaline or moderately alkaline.

Sabina series

The Sabina series consists of somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in loess and in the underlying loam glacial till. Slopes range from 0 to 3 percent.

Sabina soils commonly are adjacent to Birkbeck, Drummer, and Xenia soils. The moderately well drained Birkbeck and Xenia soils are higher on the landscape than the Sabina soils and contain less clay in the control

section. Also, Xenia soils formed in a thinner mantle of loess. The poorly drained Drummer soils formed in loess and stratified, loamy outwash in depressions and drainageways below the Sabina soils. They do not have an argillic B horizon and have a mollic epipedon.

Typical pedon of Sabina silt loam, 0 to 3 percent slopes, 455 feet north and 25 feet west of the southeast corner of sec. 28, T. 19 N., R. 14 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—10 to 13 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine platy structure parting to weak fine subangular blocky; friable; common thin dark grayish brown (10YR 4/2) films on faces of peds; neutral; abrupt smooth boundary.

B1tg—13 to 17 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) and many medium faint brown (10YR 4/3) mottles; moderate fine angular blocky structure; firm; continuous thin dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B21tg—17 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate fine prismatic structure parting to moderate medium angular blocky; firm; continuous dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—25 to 32 inches; mottled grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; common medium faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common thin very dark gray (10YR 3/1) clay films lining pores; many thin dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; gradual smooth boundary.

B23t—32 to 42 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay loam; common coarse faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few thin very dark gray (10YR 3/1) clay films lining pores; neutral; clear smooth boundary.

IIB3t—42 to 50 inches; light olive brown (2.5Y 5/4) loam; common medium distinct brownish yellow (10YR 6/6) and common fine distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; few thin dark grayish brown (10YR 4/2) clay films on faces of peds; mildly alkaline; gradual smooth boundary.

IIC—50 to 60 inches; light olive brown (2.5Y 5/4) loam; common coarse distinct light gray (10YR 7/2) and common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 44 to 60 inches. The thickness of the overlying loess ranges from 40 to 55 inches.

The Ap horizon has value of 4 or 5. The A2 horizon has value of 4 or 5 and chroma of 1 to 3. The Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. It ranges from medium acid to neutral. The clay content ranges from 35 to 42 percent in the control section. The IIB3 horizon is clay loam, loam, or silty clay loam. The IIC horizon is mildly alkaline or moderately alkaline.

Selma series

The Selma series consists of poorly drained soils on outwash plains and stream terraces. These soils formed in glacial outwash. Permeability is moderate in the solum and moderately rapid in the underlying material. Slopes range from 0 to 2 percent.

Selma soils commonly are adjacent to the somewhat poorly drained Brenton and La Hogue soils and the well drained Jasper soils. All of the adjacent soils have an argillic horizon. They are higher on the landscape than the Selma soils. Also, Brenton soils contain less sand in the control section.

Typical pedon of Selma loam, 60 feet north and 2,240 feet west of the southeast corner of sec. 27, T. 22 N., R. 8 E.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium angular blocky structure; friable; neutral; clear smooth boundary.

A12—8 to 13 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium angular blocky structure; friable; neutral; clear smooth boundary.

B1g—13 to 17 inches; dark gray (5Y 4/1) loam; few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; friable; continuous thin very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

B21g—17 to 25 inches; dark gray (5Y 4/1) loam; few fine distinct yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; moderate fine and medium subangular blocky structure; friable; common thin very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

B22g—25 to 33 inches; gray (5Y 5/1) loam; common coarse distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; friable; few thin very dark gray (10YR 3/1) organic films and few thin dark gray (5Y 4/1) films on faces of peds; neutral; clear smooth boundary.

B23g—33 to 40 inches; gray (5Y 5/1) loam; many coarse prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; few thin very dark gray (10YR 3/1) organic films lining pores; few thin dark gray (5Y 4/1) films on faces of peds; neutral; clear smooth boundary.

B3g—40 to 46 inches; gray (5Y 5/1) sandy loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few thin dark gray (5Y 4/1) films lining pores; mildly alkaline; clear smooth boundary.

Cg—46 to 73 inches; mottled gray (5Y 5/1) and yellowish brown (10YR 5/6) stratified sandy loam, loamy sand, and silt loam; very friable; mildly alkaline in the upper part and moderately alkaline in the lower part; slight effervescence at a depth of about 70 inches.

The thickness of the solum ranges from 35 to 55 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam, silty clay loam, or clay loam. The Bg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It ranges from slightly acid to mildly alkaline. It is dominantly loam or clay loam, but the lower part is sandy clay loam or sandy loam. The C horizon is stratified sand, loamy sand, sandy loam, loam, or silt loam. In some pedons it has some gravel. It ranges from neutral to moderately alkaline.

St. Charles series

The St. Charles series consists of moderately well drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying stratified, loamy outwash. Slopes range from 1 to 5 percent.

St. Charles soils commonly are adjacent to Drummer and Kendall soils. The poorly drained Drummer soils are in drainageways and depressions below the St. Charles soils. They have a mollic epipedon and do not have an argillic B horizon. The somewhat poorly drained Kendall soils are lower on the landscape than the St. Charles soils.

Typical pedon of St. Charles silt loam, 1 to 5 percent slopes, 650 feet north and 1,250 feet west of the southeast corner of sec. 10, T. 20 N., R. 7 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak thin platy structure parting to weak medium granular; friable; neutral; abrupt smooth boundary.

A2—6 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure; friable; neutral; abrupt smooth boundary.

B1—8 to 13 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

B21t—13 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; continuous thin brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—19 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; continuous thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—27 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; many thin brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B31t—38 to 44 inches; yellowish brown (10YR 5/4) silt loam; common fine faint pale brown (10YR 6/3) and common fine distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; friable; common thin brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

IIB32t—44 to 53 inches; yellowish brown (10YR 5/4) silt loam stratified with sandy loam; common medium faint pale brown (10YR 6/3) and common medium distinct brownish yellow (10YR 6/6) mottles; weak coarse prismatic structure; friable; few thin brown (10YR 4/3) clay films on faces of peds; neutral; gradual smooth boundary.

IIC—53 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 50 to 65 inches. The thickness of the overlying loess ranges from 40 to 60 inches. The depth to carbonates ranges from 45 to 70 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The A2 horizon has value of 4 to 6 and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from strongly acid to neutral. It is silty clay loam or silt loam. The clay content ranges from 27 to 35 percent in the control section. The IIB3 horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. This horizon has texture of sandy clay loam, loam, silt loam, or sandy loam. It ranges from medium acid to neutral. The IIC horizon is stratified sandy loam, silt loam, or loam.

Sunbury series

The Sunbury series consists of somewhat poorly drained, moderately permeable soils on till plains. These soils formed in loess and in the underlying calcareous loam glacial till. Slopes range from 0 to 3 percent.

Sunbury soils commonly are adjacent to Birkbeck, Catlin, and Drummer soils. The moderately well drained Birkbeck and Catlin soils are higher on the landscape than the Sunbury soils. Also, Catlin soils have a mollic epipedon. The poorly drained Drummer soils formed in loess and stratified, loamy glacial outwash in drainageways and depressions below the Sunbury soils. They have a mollic epipedon and do not have an argillic B horizon.

Typical pedon of Sunbury silt loam, 0 to 3 percent slopes, 1,620 feet south and 600 feet east of the northwest corner of sec. 32, T. 19 N., R. 14 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A2—7 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak thin platy structure; friable; slightly acid; abrupt smooth boundary.

B1—10 to 14 inches; brown (10YR 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; friable; many thin silt coatings, light brownish gray (10YR 6/2) dry, and common thin dark grayish brown coatings on faces of peds; slightly acid; clear smooth boundary.

B21t—14 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint yellowish brown (10YR 5/4) mottles; moderate fine angular blocky structure; friable; continuous thin dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—18 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; moderate medium angular blocky structure; firm; many thin dark gray (10YR 4/1) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—25 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; many moderately thick dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on faces of peds; common fine irregular dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

B24t—32 to 43 inches; brown (10YR 5/3) silty clay loam; many coarse faint yellowish brown (10YR 5/4) and few fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; common moderately thick black (10YR 2/1) clay films on faces of peds; slightly acid; clear smooth boundary.

IIB25t—43 to 52 inches; light olive brown (2.5Y 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) and common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium prismatic structure; friable; common thick black (10YR 2/1) clay films lining pores and root channels; neutral; clear smooth boundary.

IIB3t—52 to 58 inches; light olive brown (2.5Y 5/4) clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; weak coarse prismatic structure; firm; few moderately thick very dark gray (10YR 3/1) clay films lining pores and root channels; slight effervescence; mildly alkaline; clear smooth boundary.

IIC—58 to 65 inches; mottled light olive brown (2.5Y 5/4) and gray (5Y 5/1) loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 44 to 60 inches. The thickness of the overlying silty material ranges from 40 to 60 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 3 to 5 and chroma of 2 or 3. The B1 horizon has value of 4 or 5 and chroma of 3 or 4. It is medium acid or slightly acid. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It ranges from medium acid to mildly alkaline. The clay content ranges from 36 to 40 percent in the control section. The IIB horizon is silt loam, loam, or clay loam. The IIC horizon is mildly alkaline or moderately alkaline.

Swygert series

The Swygert series consists of somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in clayey glacial till. Slopes range from 1 to 5 percent.

Swygert soils commonly are adjacent to Ashkum, Bryce, and Mona soils. The poorly drained Ashkum and Bryce soils are in drainageways below the Swygert soils. Also, Ashkum soils formed in silty clay loam glacial till, and Bryce soils do not have an argillic B horizon. The moderately well drained Mona soils generally are higher on the landscape than the Swygert soils. Also, they contain less clay and more sand in the control section.

Typical pedon of Swygert silty clay loam, 1 to 5 percent slopes, 1,200 feet south and 125 feet west of the northeast corner of sec. 5, T. 22 N., R. 14 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

A3—9 to 12 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; firm; common moderately thick light olive brown (2.5Y 5/4) coatings on faces of peds; neutral; abrupt smooth boundary.

B21t—12 to 18 inches; light olive brown (2.5Y 5/4) silty clay; few fine faint olive gray (5Y 5/2) and olive (5Y 5/4) mottles; strong medium angular blocky structure; very firm; continuous moderately thick dark grayish brown (2.5Y 4/2) clay films on faces of peds; many moderately thick very dark gray (10YR 3/1) clay films lining pores; neutral; clear smooth boundary.

B22t—18 to 27 inches; olive (5Y 5/3) silty clay; common medium distinct gray (5Y 6/1) and common medium faint olive (5Y 5/4) mottles; moderate medium prismatic structure; very firm; continuous moderately thick olive gray (5Y 5/2) clay films on faces of peds; many moderately thick very dark gray (10YR 3/1) clay films lining pores; neutral; clear wavy boundary.

IIB3t—27 to 38 inches; mottled gray (5Y 5/1) and light olive brown (2.5Y 5/4) silty clay; few fine distinct olive yellow (2.5Y 6/8) mottles; moderate coarse prismatic structure; very firm; many thin dark gray (10YR 4/1) clay films lining pores; few fine black accumulations (iron and manganese oxide); slight effervescence; few white (5Y 8/1) secondary lime concretions; mildly alkaline; gradual smooth boundary.

IIC—38 to 60 inches; mottled gray (5Y 6/1) and olive (5Y 5/3) silty clay; massive; very firm; few fine black accumulations (iron and manganese oxide); violent effervescence; common white (5Y 8/1) secondary lime concretions; moderately alkaline.

The thickness of the solum ranges from 24 to 50 inches. The depth to carbonates ranges from 20 to 35 inches. The thickness of the mollic epipedon ranges from 10 to 14 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay or clay. The clay content ranges from 45 to 50 percent in the control section. The IIB3 horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 to 4. It is silty clay or clay. The IIC horizon is silty clay loam or silty clay.

Thorp series

The Thorp series consists of poorly drained, slowly permeable soils on till plains and outwash plains. These soils formed in silty material and in the underlying loamy outwash or till. Slope is 0 to 1 percent.

Thorp soils commonly are adjacent to the somewhat poorly drained Brenton, Elburn, and Flanagan soils, the moderately well drained Plano soils, and the well drained Wea soils. All of the adjacent soils are on slight rises above the Thorp soils. Flanagan soils contain more clay in the control section than the Thorp soils. Brenton, Elburn, and Plano soils do not have a grayish brown A2 horizon. Wea soils contain more sand in the control section than the Thorp soils. Also, they formed in coarser textured material.

Typical pedon of Thorp silt loam, 665 feet west and 685 feet south of the northeast corner of sec. 30, T. 19 N., R. 9 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—11 to 17 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine faint dark yellowish brown (10YR 4/6) mottles; weak very thin platy structure parting to weak fine granular; friable; common thin very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

B1t—17 to 22 inches; grayish brown (10YR 5/2) silty clay loam; few fine faint dark yellowish brown (10YR 4/6) mottles; moderate fine subangular blocky structure; friable; many thin dark grayish brown (10YR 4/2) clay films and many thin light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

B21t—22 to 33 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure; firm; common thin gray (10YR 5/1) and common moderately thick very dark gray (10YR 3/1) clay films on faces of peds; neutral; gradual smooth boundary.

B22t—33 to 53 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; firm; few thin grayish brown (10YR 5/2) clay films on faces of peds; few thin dark gray (10YR 4/1) clay films lining pores; neutral; clear smooth boundary.

IIB3t—53 to 64 inches; mottled light gray (10YR 6/1) and gray (10YR 5/2) stratified loam and silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; friable; few thin very dark gray (10YR 3/1) clay films lining pores; neutral.

The thickness of the solum ranges from 40 to 65 inches. The thickness of the overlying silty material ranges from 30 to 54 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The A2 horizon has value of 4 to 6 and chroma of 1 or 2. The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or silt loam. It ranges from strongly acid to neutral. The IIB3 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 8. It ranges from medium acid to

mildly alkaline. It is stratified loam, silt loam, silty clay loam, clay loam, sandy clay loam, or sandy loam.

Varna series

The Varna series consists of moderately well drained, slowly permeable or moderately slowly permeable soils on till plains and moraines. These soils formed in a thin layer of loess and in the underlying calcareous silty clay loam glacial till. Slopes range from 2 to 12 percent.

Varna soils commonly are adjacent to Ashkum and Elliott soils. The poorly drained Ashkum soils are in drainageways and depressions below the Varna soils. The somewhat poorly drained Elliott soils also are in areas below the Varna soils.

Typical pedon of Varna silt loam, 2 to 5 percent slopes, eroded, 45 feet south and 2,050 feet east of the northwest corner of sec. 2, T. 22 N., R. 8 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A3—7 to 11 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; strong medium angular and subangular blocky structure; friable; common brown (10YR 4/3) flecks of B material; neutral; abrupt smooth boundary.

B21t—11 to 18 inches; brown (10YR 4/3) silty clay; strong fine subangular blocky structure; firm; many thin very dark gray (10YR 3/1) clay films on faces of peds; neutral; clear smooth boundary.

B22t—18 to 25 inches; olive brown (2.5Y 4/4) silty clay; strong medium subangular blocky structure; firm; continuous thin very dark gray (10YR 3/1) clay films lining pores; common thick very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

B23t—25 to 31 inches; olive brown (2.5Y 4/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure; firm; many thin very dark gray (10YR 3/1) clay films lining pores; slight effervescence; mildly alkaline; clear smooth boundary.

B3t—31 to 40 inches; olive (5Y 5/3) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure; firm; common thin dark grayish brown (2.5Y 4/2) clay films on faces of peds; common medium secondary lime accumulations; strong effervescence; mildly alkaline; abrupt smooth boundary.

C—40 to 60 inches; olive gray (5Y 5/2) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; very firm; many medium secondary lime accumulations; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 16 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 3 or 4. It ranges from medium acid to neutral in the upper part and from slightly acid to moderately alkaline in the lower part. The clay content ranges from 35 to 45 percent in the control section. The C horizon is silty clay loam or clay loam.

Varna silty clay loam, 5 to 12 percent slopes, severely eroded, has a thinner surface layer than is defined as the range for the Varna series. This difference, however, does not significantly affect the use or behavior of the soil.

Wea series

The Wea series consists of well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in a thin layer of loess and in the underlying stratified outwash and gravel. Slopes range from 0 to 3 percent.

Wea soils commonly are adjacent to Brenton, Drummer, and La Hogue soils. Brenton and La Hogue soils are somewhat poorly drained and are lower on the landscape than the Wea soils. Also, Brenton soils contain less sand in the control section. Drummer soils also contain less sand in the control section. They are poorly drained and are in drainageways and depressions below the Wea soils.

Typical pedon of Wea silt loam, 0 to 3 percent slopes, 1,200 feet north and 120 feet west of the southeast corner of sec. 8, T. 22 N., R. 14 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.

A12—10 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; clear smooth boundary.

B1—15 to 20 inches; dark brown (10YR 3/3) silty clay loam, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure; friable; many thin very dark grayish brown (10YR 3/2) films on faces of peds; neutral; clear smooth boundary.

IIB21t—20 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine prismatic structure parting to moderate medium subangular blocky; firm; many thin dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

IIB22t—24 to 32 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many thin very dark grayish brown (10YR 3/2) clay

films on faces of peds; slightly acid; clear smooth boundary.

IIB23t—32 to 40 inches; dark yellowish brown (10YR 3/4) clay loam; weak coarse subangular blocky structure; firm; many moderately thick dark brown (7.5YR 3/2) clay films on faces of peds; medium acid; clear smooth boundary.

IIB3t—40 to 62 inches; dark yellowish brown (10YR 3/4) gravelly loam; weak coarse subangular blocky structure; friable; many moderately thick dark brown (7.5YR 3/2) clay films on faces of peds; medium acid; abrupt smooth boundary.

IIIC—62 to 70 inches; dark yellowish brown (10YR 4/4) coarse sand and some gravel; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 70 inches. The thickness of the mollic epipedon ranges from 12 to 19 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or loam. The IIBt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam or silty clay loam in the upper part and gravelly loam, gravelly clay loam, or sandy loam in the lower part. It is medium acid to neutral. The C horizon is mildly alkaline or moderately alkaline. It is either sand and gravel or gravel.

Xenia series

The Xenia series consists of moderately well drained, moderately slowly permeable soils on till plains. These soils formed in loess and in the underlying calcareous loam till. Slopes range from 2 to 5 percent.

Xenia soils commonly are adjacent to Drummer, Sabina, and Sunbury soils. The poorly drained Drummer soils formed in loess and stratified, loamy outwash in drainageways and depressions below the Xenia soils. The somewhat poorly drained Sabina and Sunbury soils are lower on the landscape than the Xenia soils. They have a fine textured subsoil. Also, Sunbury soils have a mollic surface layer.

Typical pedon of Xenia silt loam, 2 to 5 percent slopes, 564 feet north and 860 feet west of the southeast corner of sec. 34, T. 20 N., R. 9 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; neutral; abrupt smooth boundary.

A2—4 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium platy structure; friable; many thin light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

B1t—10 to 16 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common thin dark grayish brown (10YR 4/2) clay films and common thin light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

B21t—16 to 23 inches; brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; friable; common thin dark grayish brown (10YR 4/2) clay films and common thin light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

B22t—23 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium faint grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; moderate medium and coarse subangular blocky structure; firm; many thin grayish brown (10YR 5/2) silt coatings and common moderately thick dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB23t—37 to 48 inches; mottled brown (10YR 5/3) and light olive brown (2.5Y 5/4) clay loam; weak coarse subangular blocky structure; firm; few moderately thick brown (10YR 4/3) clay films on faces of peds; medium acid; gradual smooth boundary.

IIB3t—48 to 57 inches; mottled brown (10YR 5/3) and light olive brown (2.5Y 5/4) loam; weak coarse prismatic structure; firm; few moderately thick dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

IIC—57 to 72 inches; light olive brown (2.5Y 5/4) loam; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 36 to 65 inches. The thickness of the overlying loess ranges from 22 to 40 inches.

The A1 or Ap horizon has value of 3 or 4 and chroma of 2 to 4. The B and IIB horizons have value of 4 or 5 and chroma of 3 or 4. The B2 and IIB2 horizons are medium acid or strongly acid. The clay content ranges from 27 to 35 percent in the control section. The IIB2 horizon is silty clay loam or clay loam. The IIB3 horizon is clay loam or loam. It ranges from slightly acid to mildly alkaline. The IIC horizon is loam or clay loam.

formation of the soils

By Mark R. La Van, Champaign County soil scientist, with help from Robert Gilkeson, assistant geologist, Illinois State Geological Survey.

Soil forming processes act on parent material deposited by geologic agents, such as wind, water, or glacial ice. The characteristics of the soil are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate, especially rainfall and temperature; (3) the kind of plant and animal life on or in the soil, especially the native vegetation; (4) the topography; and (5) the length of time that the processes have acted on the soil material (*7*). These factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four.

parent material

Parent material is the unconsolidated geologic material in which the soils formed. It determines the mineralogical and chemical composition of the soil. Most of the soils in Champaign County formed in loess over glacial till, in loess over glacial outwash, or in alluvium.

Champaign County was covered by glacial ice during three major glaciations. The most recent glaciation, the Wisconsin, formed the present surface topography and deposited the geologic material in which the modern soils formed. The numerous advances and retreats of the glacial ice left many moraines and till plains. Glacial till, a geologic material deposited directly by glacial ice, is throughout the county. It ranges from loam to silty clay. Glacial melt water deposited outwash in front of the moraines. The outwash ranges from less than 1 to more than 10 feet in thickness and from fine silt in shallow lakes to coarse sand and gravel in stream channels.

After the glacier receded, windblown silt, or loess, was deposited over the outwash and till. In the uplands it ranges from less than 10 to about 60 inches in thickness. The valley of the Illinois River was an important source of the loess (*13*).

Miami soils formed in as much as 18 inches of loess and in the underlying loam glacial till. Dana soils formed in 20 to 40 inches of loess and in the underlying loam glacial till. Drummer soils formed in 40 to 60 inches of loess or water-laid silty material and in the underlying stratified, loamy outwash.

Soils on flood plains and other areas on bottom land formed in water-laid material that ranges from loam to silty clay loam. In many areas the flood plains still receive sediments. Ross soils formed in loamy sediments on alluvial flood plains and low terraces along the major streams. The nearly level Colo soils formed in silty and loamy alluvial sediments on flood plains along both major and minor streams.

The characteristics of the geologic material can cause differences among soils that are near one another on the landscape. Examples are the Bryce, Catlin, Flanagan, and Swygert soils on till plains and moraines. The Bryce and Swygert soils formed in fine textured material. They exhibit less profile development and are more shallow to carbonates than the Catlin and Flanagan soils, which formed in medium textured till. These differences are caused by a slower rate of water movement through the fine textured soils (*12*). The slower permeability reduces the extent to which

Figure 18.—Crawfish chimney, a common feature on poorly drained and very poorly drained soils in Champaign County.

carbonates are leached, the downward movement of clay, and the rate of other chemical and physical processes.

plant and animal life

Living organisms, such as plants, animals, bacteria, and fungi, affect soil formation. Burrowing animals help to keep the soil open and porous (fig. 18). Bacteria and fungi help to decompose plant and animal remains. The plant cover generally determines the content of organic matter, the color of the surface layer, and the amount of plant nutrients.

On about 93 percent of the acreage, the soils in Champaign County formed under prairie grasses. Drummer and Elburn soils are examples. They have a dark surface layer and a high content of organic matter. The perennial fires on the prairie tended to restrict the forest vegetation to areas near the major drainageways. On only about 7 percent of the acreage, the soils formed under forest vegetation. Russell and St. Charles soils are examples. Their surface layer is lighter colored than that of Drummer or Elburn soils. Also, the content of organic matter is lower.

climate

Climate affects the types of plants on the soil and the weathering of soil material. The midcontinental climate in Champaign County has favored the generally rapid weathering of soil material, the formation of clay, and the downward movement of clay through the profile. As a result of the translocation of clay, the subsoil of most upland soils in the county contains more clay than the surface layer. Further information about the climate is provided under the heading "General nature of the county."

topography

Topography characteristics, such as the gradient, shape, and aspect of slopes, cause many differences among soils. They affect drainage, erosion, and deposition. Soils that formed in similar parent material, such as Drummer, Kendall, and St. Charles soils, may differ because of topography. On the other hand, soils that formed in areas where the topography is similar may have similar drainage characteristics, even though the parent materials differ. Brenton and Raub soils are examples.

time

Time greatly affects the degree of profile development in a soil. The influence of time, however, can be modified by erosion, the deposition of material, the topography, and the kind of parent material.

On the more sloping soils, erosion may remove the surface soil material as soon as the soil forms. These soils are immature, or young, even though the slopes have been exposed to weathering for thousands of years. Chatsworth soils are an example.

The soils on flood plains receive alluvial material during each flood. This repeated deposition slows soil formation. Colo soils are an example.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

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 coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the

surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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 (in tables). The walls of excavations tend to cave in or slough.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.
Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.
Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.
Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by 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 wearing away of mountains and the

building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion. *Erosion* (accelerated). Erosion 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 the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

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 soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon 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.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have 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 in which the solum 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.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface,

have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

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. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated 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 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It 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.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or 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 grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. 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."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

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 water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-73 at Urbana, Illinois]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	33.2	18.0	25.6	60	-11	18	1.56	.63	2.35	4	5.3
February	37.4	21.0	29.3	62	-8	18	1.87	.89	2.70	5	5.7
March	47.9	30.5	39.2	78	9	172	3.24	1.43	4.78	7	5.2
April	62.2	41.7	52.0	84	25	364	3.79	2.00	5.34	8	.8
May	73.0	51.6	62.3	91	35	691	3.57	2.07	4.90	7	.0
June	82.7	61.0	71.8	97	46	954	4.40	2.42	6.14	7	.0
July	85.0	64.8	74.9	96	51	1,082	4.81	2.72	6.65	6	.0
August	83.8	62.7	73.2	94	47	1,029	3.06	1.44	4.44	4	.0
September	78.7	55.7	67.2	95	38	816	2.99	.87	4.70	5	.0
October	66.4	44.6	55.6	87	26	484	2.79	.93	4.31	5	.0
November	50.1	33.3	41.7	74	10	125	2.45	1.27	3.48	5	1.9
December	38.4	24.3	31.4	65	-3	33	2.40	.73	3.76	5	3.8
Yearly:											
Average	61.6	42.4	52.0	---	---	---	---	---	---	---	---
Extreme	---	---	---	100	-12	---	---	---	---	---	---
Total	---	---	---	---	---	5,786	36.93	30.76	44.37	68	22.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-73 at Urbana, Illinois]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 8	April 17	April 29
2 years in 10 later than--	April 3	April 13	April 25
5 years in 10 later than--	March 24	April 5	April 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 26	October 20	October 15
2 years in 10 earlier than--	November 1	October 24	October 19
5 years in 10 earlier than--	November 10	November 1	October 26

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-73 at Urbana, Illinois]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	210	192	178
8 years in 10	217	198	183
5 years in 10	231	209	192
2 years in 10	245	221	200
1 year in 10	252	227	205

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
23A	Blount silt loam, 0 to 2 percent slopes	1,005	0.2
23B	Blount silt loam, 2 to 5 percent slopes	624	0.1
27B	Miami silt loam, 2 to 5 percent slopes	267	*
27C2	Miami silt loam, 5 to 10 percent slopes, eroded	755	0.1
27D2	Miami silt loam, 10 to 15 percent slopes, eroded	429	0.1
27E2	Miami silt loam, 15 to 25 percent slopes, eroded	406	0.1
56B	Dana silt loam, 2 to 5 percent slopes	23,839	3.7
67	Harpster silty clay loam	2,252	0.4
73	Ross silt loam	1,001	0.2
91B	Swygert silty clay loam, 1 to 5 percent slopes	3,448	0.5
102A	La Hogue loam, 0 to 3 percent slopes	1,476	0.2
125	Selma loam	2,703	0.4
131B	Alvin sandy loam, 1 to 5 percent slopes	212	*
134B	Camden silt loam, 1 to 5 percent slopes	1,244	0.2
146B	Elliott silt loam, 1 to 5 percent slopes	31,039	4.8
148B	Proctor silt loam, 1 to 5 percent slopes	8,881	1.4
149A	Brenton silt loam, 0 to 3 percent slopes	16,183	2.5
150B	Onarga sandy loam, 1 to 5 percent slopes	268	*
152	Drummer silty clay loam	248,094	38.8
153	Pella silty clay loam	6,368	1.0
154A	Flanagan silt loam, 0 to 3 percent slopes	99,607	15.6
171B	Catlin silt loam, 2 to 7 percent slopes	16,069	2.5
194B	Morley silt loam, 2 to 5 percent slopes	738	0.1
194C2	Morley silt loam, 5 to 12 percent slopes, eroded	890	0.1
194D2	Morley silt loam, 12 to 20 percent slopes, eroded	251	*
198A	Elburn silt loam, 0 to 3 percent slopes	17,048	2.7
199B	Plano silt loam, 1 to 5 percent slopes	5,330	0.8
206	Thorp silt loam	2,736	0.4
219	Millbrook silt loam	1,426	0.2
221B	Parr silt loam, 2 to 5 percent slopes	7,708	1.2
221C2	Parr silt loam, 5 to 10 percent slopes, eroded	5,821	0.9
221D3	Parr clay loam, 10 to 15 percent slopes, severely eroded	330	0.1
223B2	Varna silt loam, 2 to 5 percent slopes, eroded	11,142	1.7
223C3	Varna silty clay loam, 5 to 12 percent slopes, severely eroded	3,044	0.5
232	Ashkum silty clay loam	28,281	4.4
233B	Birkbeck silt loam, 1 to 5 percent slopes	2,735	0.4
234A	Sunbury silt loam, 0 to 3 percent slopes	1,797	0.3
235	Bryce silty clay	1,489	0.2
236A	Sabina silt loam, 0 to 3 percent slopes	2,760	0.4
241D	Chatsworth silty clay, 7 to 15 percent slopes	288	*
242A	Kendall silt loam, 0 to 3 percent slopes	1,545	0.2
243B	St. Charles silt loam, 1 to 5 percent slopes	1,842	0.3
291B	Xenia silt loam, 2 to 5 percent slopes	5,299	0.8
302	Ambraw silty clay loam	2,687	0.4
322C2	Russell silt loam, 4 to 11 percent slopes, eroded	1,867	0.3
330	Peotone silty clay loam	3,678	0.6
387B	Ockley silt loam, 1 to 5 percent slopes	1,174	0.2
387C3	Ockley clay loam, 5 to 12 percent slopes, severely eroded	278	*
398A	Wea silt loam, 0 to 3 percent slopes	3,213	0.5
402	Colo silty clay loam	10,643	1.7
440B	Jasper loam, 1 to 5 percent slopes	2,410	0.4
440C2	Jasper loam, 5 to 10 percent slopes, eroded	778	0.1
448B	Mona silt loam, 2 to 7 percent slopes	297	*
481A	Raub silt loam, 0 to 3 percent slopes	22,269	3.5
490A	Odell silt loam, 0 to 3 percent slopes	1,319	0.2
533	Urban land	1,235	0.2
570B	Martinsville silt loam, 2 to 5 percent slopes	778	0.1
570C2	Martinsville loam, 5 to 10 percent slopes, eroded	1,054	0.2
570D2	Martinsville loam, 10 to 18 percent slopes, eroded	275	*
637	Muskego silty clay loam, overwash	44	*
802	Orthents, loamy	3,554	0.6
865	Pits, gravel	313	*
2027C	Miami-Urban land complex, 2 to 10 percent slopes	384	0.1
2152	Drummer-Urban land complex, 0 to 2 percent slopes	4,300	0.7
2154A	Flanagan-Urban land complex, 0 to 3 percent slopes	3,695	0.6
2171B	Catlin-Urban land complex, 2 to 7 percent slopes	1,662	0.3
2198A	Elburn-Urban land complex, 0 to 3 percent slopes	766	0.1
2236A	Sabina-Urban land complex, 0 to 3 percent slopes	232	*
2481A	Raub-Urban land complex, 0 to 3 percent slopes	1,163	0.2
	Water	1,262	0.2
	Total	640,000	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Oats	Grass-legume hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
23A---------- Blount	106	35	48	64	4.3	---
23B---------- Blount	105	35	47	63	4.3	---
27B---------- Miami	110	38	50	---	3.6	---
27C2---------- Miami	95	33	43	---	3.1	---
27D2---------- Miami	80	28	36	---	2.6	---
56B---------- Dana	130	46	52	---	4.3	---
67---------- Harpster	136	44	52	74	5.0	8.3
73---------- Ross	130	44	50	---	5.0	---
91B---------- Swygert	113	39	50	72	4.5	---
102A---------- La Hogue	129	43	56	80	5.2	8.6
125---------- Selma	136	44	53	76	5.0	---
131B---------- Alvin	97	33	48	---	4.3	7.1
134B---------- Camden	124	39	54	71	5.0	8.2
146B---------- Elliott	127	45	54	78	5.1	8.4
148B---------- Proctor	143	44	58	87	5.4	9.1
149A---------- Brenton	126	47	62	91	5.9	9.8
150B---------- Onarga	109	36	48	73	4.2	6.9
152---------- Drummer	154	51	61	83	5.5	9.2
153---------- Pella	125	45	50	75	4.8	8.0
154A---------- Flanagan	162	52	67	92	6.1	10.2

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Oats	Grass-legume hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
171B---------- Catlin	149	46	60	86	5.7	9.6
194B---------- Morley	102	35	47	63	4.3	7.0
194C2---------- Morley	100	34	46	62	4.2	6.9
194D2---------- Morley	90	---	41	56	3.7	6.2
198A---------- Elburn	161	50	63	94	6.1	10.2
199B---------- Plano	150	45	59	89	5.7	9.6
206---------- Thorp	105	36	42	60	4.0	7.0
219---------- Millbrook	144	43	59	81	5.4	9.0
221B---------- Parr	120	42	54	---	4.0	---
221C2---------- Parr	105	37	47	---	3.4	---
221D3---------- Parr	---	---	39	---	2.8	---
223B2---------- Varna	122	41	52	74	4.8	7.9
223C3---------- Varna	107	36	46	65	4.2	7.0
232---------- Ashkum	130	47	54	79	5.0	---
233B---------- Birkbeck	122	41	54	69	4.9	8.2
234A---------- Sunbury	149	45	62	84	5.6	8.1
235---------- Bryce	120	43	48	70	4.4	---
236A---------- Sabina	133	42	56	75	5.2	8.7
241D---------- Chatsworth	---	---	---	---	---	1.0
242A---------- Kendall	135	41	55	75	5.2	8.7
243B---------- St. Charles	126	39	55	72	5.0	8.1
291B---------- Xenia	120	42	48	---	4.0	---
302---------- Ambraw	110	36	42	61	4.1	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Oats	Grass-legume hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
322C2--Russell	105	37	42	---	3.4	---
330--Peotone	123	42	43	58	4.2	---
387B--Ockley	110	38	44	---	3.6	---
387C3--Ockley	90	32	36	---	3.0	---
398A--Wea	120	42	48	---	4.0	---
402--Colo	104	40	---	78	4.2	7.0
440B--Jasper	125	44	50	---	4.1	---
440C2--Jasper	120	42	48	---	4.0	---
448B--Mona	114	37	50	33	4.5	7.4
481A--Raub	140	49	56	---	4.6	---
490A--Odell	130	46	58	---	4.3	---
570B--Martinsville	120	42	48	---	4.0	---
570C2--Martinsville	105	37	42	---	3.4	---
570D2--Martinsville	90	32	36	---	3.0	---
637--Muskego	123	42	---	---	4.0	---

* 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 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
23A, 23B---------- Blount	3c	Slight	Slight	Severe	Severe	White oak----------	65	Eastern white pine, red pine, yellow-poplar.
						Northern red oak----	65	
						Green ash----------	---	
						Bur oak----------	---	
						Pin oak----------	---	
27B, 27C2, 27D2---- Miami	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
27E2---------- Miami	1r	Moderate	Moderate	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
56B---------- Dana	---	---	---	---	---	---	---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
67---------- Harpster	---	---	---	---	---	---	---	American sycamore, red maple, green ash, pin oak, common hackberry, European larch, swamp white oak.
73---------- Ross	1o	Slight	Slight	Slight	Slight	Northern red oak----	86	Eastern white pine, black walnut, white ash, yellow-poplar.
						Yellow-poplar-------	96	
						Sugar maple---------	85	
91B---------- Swygert	---	---	---	---	---	---	---	Green ash, European larch, pin oak.
102A---------- La Hogue	---	---	---	---	---	---	---	American sycamore, eastern cottonwood, green ash, bur oak, eastern white pine.
125---------- Selma	---	---	---	---	---	---	---	American sycamore, common hackberry, European larch, green ash, pin oak, red maple, swamp white oak.
131B---------- Alvin	2o	Slight	Slight	Slight	Slight	White oak----------	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak----	80	
						Black walnut--------	---	
						Yellow-poplar-------	90	
134B---------- Camden	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	White oak, black walnut, green ash, eastern white pine, red pine, yellow-poplar, white ash.
						White oak----------	85	
						Northern red oak----	85	
						Green ash----------	76	

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
146B---------- Elliott	---	---	---	---	---	---	---	White oak, northern red oak, green ash, sugar maple, eastern white pine.
148B---------- Proctor	---	---	---	---	---	---	---	Black walnut, green ash, red maple, eastern white pine, red pine.
149A---------- Brenton	---	---	---	---	---	---	---	Eastern cottonwood, American sycamore, yellow-poplar, white oak, northern red oak, green ash, sugar maple.
150B---------- Onarga	---	---	---	---	---	---	---	Eastern white pine, red pine.
152---------- Drummer	---	---	---	---	---	---	---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak.
153---------- Pella	---	---	---	---	---	---	---	Green ash, European larch.
154A---------- Flanagan	---	---	---	---	---	---	---	Eastern cottonwood, green ash, yellow-poplar, eastern white pine.
171B---------- Catlin	---	---	---	---	---	---	---	Black walnut, white oak, green ash, northern red oak, eastern white pine, white ash.
194B, 194C2-------- Morley	2o	Slight	Slight	Slight	Slight	White oak----------	80	White oak, black walnut, green ash, eastern white pine, red pine.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Shagbark hickory----	---	
194D2---------- Morley	2r	Moderate	Moderate	Moderate	Slight	White oak----------	80	White oak, black walnut, green ash, eastern white pine, red pine.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Shagbark hickory----	---	
198A---------- Elburn	---	---	---	---	---	---	---	Eastern cottonwood, green ash, yellow-poplar, eastern white pine.
199B---------- Plano	---	---	---	---	---	---	---	Black walnut, eastern white pine, red pine, green ash, northern red oak.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
206---------- Thorp	---	---	---	---	---	---	---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak.
219---------- Millbrook	2o	Slight	Slight	Slight	Slight	White oak----------	80	White oak, black walnut, northern red oak, green ash, sugar maple.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
221B, 221C2, 221D3- Parr	---	---	---	---	---	---	---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
223B2, 223C3------- Varna	---	---	---	---	---	---	---	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine.
232---------- Ashkum	---	---	---	---	---	---	---	American sycamore, common hackberry, European larch, green ash, pin oak, red maple, swamp white oak.
233B---------- Birkbeck	1o	Slight	Slight	Slight	Slight	White oak----------	86	White oak, northern red oak, green ash, black walnut, eastern white pine, red pine.
						Northern red oak----	---	
						Green ash----------	---	
234A---------- Sunbury	---	---	---	---	---	---	---	American sycamore, eastern cottonwood, green ash, red maple, eastern white pine.
236A---------- Sabina	2o	Slight	Slight	Slight	Slight	White oak----------	80	White oak, northern red oak, eastern cottonwood, American sycamore, sugar maple, eastern white pine.
						Northern red oak----	80	
						Black walnut--------	---	
242A---------- Kendall	2o	Slight	Slight	Slight	Slight	White oak----------	80	White oak, northern red oak, green ash, eastern white pine, red pine.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
243B---------- St. Charles	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	White oak, black walnut, sugar maple, eastern white pine, red pine.
						White oak----------	85	
						Northern red oak----	85	
						Green ash----------	---	
291B---------- Xenia	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar-------	98	

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
302---------- Ambraw	---	---	---	---	---	---	---	Eastern cottonwood, red maple, American sycamore, pin oak.
322C2---------- Russell	1o	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Yellow-poplar-------	90 90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
330---------- Peotone	---	---	---	---	---	---	---	Pin oak, green ash, red maple, American sycamore, common hackberry, eastern cottonwood, European larch, swamp white oak.
387B, 387C3-------- Ockley	1o	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Yellow-poplar-------	90 90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
398A---------- Wea	---	---	---	---	---	---	---	Eastern white pine, red pine, black walnut, yellow-poplar white ash.
440B, 440C2-------- Jasper	---	---	---	---	---	---	---	Eastern white pine, white ash, yellow-poplar, black walnut.
448B---------- Mona	---	---	---	---	---	---	---	Black walnut, American sycamore, green ash, bur oak, common hackberry, eastern white pine, red pine.
481A---------- Raub	---	---	---	---	---	---	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
490A---------- Odell	---	---	---	---	---	---	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
570B, 570C2, 570D2- Martinsville	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
637---------- Muskego	---	---	---	---	---	---	---	Black spruce, tamarack.
2027C*: Miami----------	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Urban land.								

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
2152*:								
Drummer	---	---	---	---	---	---	---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak.
Urban land.								
2154A*:								
Flanagan	---	---	---	---	---	---	---	Eastern cottonwood, green ash, yellow-poplar, eastern white pine.
Urban land.								
2171B*:								
Catlin	---	---	---	---	---	---	---	Black walnut, white oak, green ash, northern red oak, eastern white pine, white ash.
Urban land.								
2198A*:								
Elburn	---	---	---	---	---	---	---	Eastern cottonwood, green ash, yellow-poplar, eastern white pine.
Urban land.								
2236A*:								
Sabina	2o	Slight	Slight	Slight	Slight	White oak	80	White oak, northern red oak, eastern cottonwood, American sycamore, sugar maple, eastern white pine.
						Northern red oak	80	
						Black walnut	---	
Urban land.								
2481A*:								
Raub	---	---	---	---	---	---	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Urban land.								

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
23A, 23B---------- Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
27B, 27C2, 27D2--- Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
27E2. Miami					
56B---------- Dana	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
67---------- Harpster	---	Tatarian honeysuckle, nannyberry viburnum, Washington hawthorn.	White spruce, northern white-cedar, eastern redcedar, green ash, osageorange.	Black willow------	---
73---------- Ross	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
91B---------- Swygert	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak----------	---
102A---------- La Hogue	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
125---------- Selma	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
131B--- Alvin	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
134B--- Camden	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
146B--- Elliott	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
148B--- Proctor	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
149A--- Brenton	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
150B--- Onarga	---	Amur privet, Washington hawthorn, American cranberrybush, Tatarian honeysuckle, Amur honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Red pine, Norway spruce, eastern white pine.	---
152--- Drummer	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Norway spruce, Washington hawthorn, white fir, blue spruce, Austrian pine.	Eastern white pine	Pin oak.
153--- Pella	---	Nannyberry viburnum, Tatarian honeysuckle, Washington hawthorn.	Eastern redcedar, white spruce, northern white-cedar, green ash.	Black willow------	---
154A--- Flanagan	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
171B--- Catlin	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
194B, 194C2, 194D2---------- Morley	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
198A---------- Elburn	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, northern white-cedar, Washington hawthorn, blue spruce.	Norway spruce-----	Eastern white pine, pin oak.
199B---------- Plano	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
206---------- Thorp	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
219---------- Millbrook	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
221B, 221C2, 221D3---------- Parr	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
223B2, 223C3------ Varna	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, arrowwood, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
232---------- Ashkum	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, northern white-cedar, Norway spruce, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
233B---------- Birkbeck	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
234A---------- Sunbury	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
235---------- Bryce	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
236A---------- Sabina	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
241D---------- Chatsworth	Tatarian honeysuckle, lilac, Amur honeysuckle.	Eastern redcedar	Austrian pine-----	---	---
242A---------- Kendall	---	Amur privet, Washington hawthorn, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.
243B---------- St. Charles	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
291B---------- Xenia	---	Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn, Amur privet.	Norway spruce-----	Eastern white pine, pin oak.
302---------- Ambraw	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
322C2---------- Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
330---------- Peotone	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
387B, 387C3---- Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
398A---- Wea	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
402---- Colo	Gray dogwood, silky dogwood.	Tatarian honeysuckle, redosier dogwood, Zabel honeysuckle.	Laurel willow, white spruce, Amur maple, northern white-cedar.	Green ash----	Silver maple, eastern cottonwood.
440B, 440C2---- Jasper	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
448B---- Mona	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
481A---- Raub	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
490A---- Odell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
533*. Urban land					
570B, 570C2, 570D2---- Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
637---- Muskego	Common ninebark, whitebelle honeysuckle.	Amur privet, nannyberry viburnum, silky dogwood, Amur honeysuckle, Tatarian honeysuckle.	Tall purple willow	Black willow, golden willow.	Imperial Carolina poplar.
802*. Orthents					
865*. Pits					

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
2027C*:					
Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					
2152*:					
Drummer	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Norway spruce, Washington hawthorn, white fir, blue spruce, Austrian pine.	Eastern white pine	Pin oak.
Urban land.					
2154A*:					
Flanagan	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak
Urban land.					
2171B*:					
Catlin	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
Urban land.					
2198A*:					
Elburn	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, northern white-cedar, Washington hawthorn, blue spruce.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
2236A*:					
Sabina	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
Urban land.					
2481A*:					
Raub	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
23A, 23B---------- Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
27B---------- Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
27C2---------- Miami	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
27D2---------- Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
27E2---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
56B---------- Dana	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
73---------- Ross	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
91B---------- Swygert	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
102A---------- La Hogue	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
125---------- Selma	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
131B---------- Alvin	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
134B---------- Camden	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
146B---------- Elliott	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
148B---------- Proctor	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
149A---------- Brenton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
150B---------- Onarga	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
152---------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
153---------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
154A---------- Flanagan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
171B---------- Catlin	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Slight.
194B---------- Morley	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
194C2---------- Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
194D2---------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
198A---------- Elburn	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
199B---------- Plano	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
206---------- Thorp	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
219---------- Millbrook	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
221B---------- Parr	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
221C2---------- Parr	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
221D3---------- Parr	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
223B2---------- Varna	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
223C3---------- Varna	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: large stones, slope.
232---------- Ashkum	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
233B---------- Birkbeck	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
234A---------- Sunbury	Severe: wetness, excess humus.	Severe: excess humus.	Severe: excess humus, wetness.	Severe: excess humus.	Moderate: wetness.
235---------- Bryce	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
236A---------- Sabina	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
241D---------- Chatsworth	Severe: percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: slope, too clayey, percs slowly.	Severe: too clayey.	Severe: droughty, too clayey.
242A---------- Kendall	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
243B---------- St. Charles	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
291B---------- Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slignt.
302---------- Ambraw	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
322C2---------- Russell	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
330---------- Peotone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
387B---------- Ockley	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
387C3---------- Ockley	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
398A---------- Wea	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
402---------- Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
440B---------- Jasper	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
440C2---------- Jasper	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
448B---------- Mona	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, slope.	Slight----------	Slight.
481A---------- Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
490A---------- Odell	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
533*. Urban land					
570B---------- Martinsville	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
570C2---------- Martinsville	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
570D2---------- Martinsville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
637---------- Muskego	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
802*. Orthents					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
865*. Pits					
2027C*: Miami	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
Urban land.					
2152*: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Urban land.					
2154A*: Flanagan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
2171B*: Catlin	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Slight.
Urban land.					
2198A*: Elburn	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
2236A*: Sabina	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
2481A*: Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

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	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
23A---------- Blount	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
23B---------- Blount	Fair	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
27B---------- Miami	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
27C2---------- Miami	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
27D2, 27E2---------- Miami	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
56B---------- Dana	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
67---------- Harpster	Fair	Fair	Good	Fair	Good	Fair	Fair	Fair	Fair.
73---------- Ross	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
91B---------- Swygert	Fair	Good	Good	Good	Fair	Poor	Good	Good	Poor.
102A---------- La Hogue	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
125---------- Selma	Good	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
131B---------- Alvin	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
134B---------- Camden	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
146B---------- Elliott	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor.
148B---------- Proctor	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
149A---------- Brenton	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
150B---------- Onarga	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
152---------- Drummer	Fair	Good	Good	Fair	Good	Good	Good	Fair	Good.
153---------- Pella	Good	Good	Good	Fair	Good	Good	Good	Fair	Good.
154A---------- Flanagan	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
171B---------- Catlin	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

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	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
194B---------- Morley	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
194C2---------- Morley	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
194D2---------- Morley	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
198A---------- Elburn	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
199B---------- Plano	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
206---------- Thorp	Good	Good	Good	Good	Good	Good	Good	Good	Good.
219---------- Millbrook	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
221B---------- Parr	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
221C2---------- Parr	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
221D3---------- Parr	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
223B2---------- Varna	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
223C3---------- Varna	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
232---------- Ashkum	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
233B---------- Birkbeck	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
234A---------- Sunbury	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
235---------- Bryce	Good	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
236A---------- Sabina	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
241D---------- Chatsworth	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
242A---------- Kendall	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
243B---------- St. Charles	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
291B---------- Xenia	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
302---------- Ambraw	Good	Fair	Good	Good	Good	Good	Good	Good	Good.
322C2---------- Russell	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

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	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
330---------- Peotone	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
387B---------- Ockley	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
387C3---------- Ockley	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
398A---------- Wea	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
402---------- Colo	Good	Fair	Good	Fair	Good	Good	Fair	Fair	Good.
440B---------- Jasper	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
440C2---------- Jasper	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
448B---------- Mona	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
481A---------- Raub	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
490A---------- Odell	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
533*. Urban land									
570B---------- Martinsville	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
570C2---------- Martinsville	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
570D2---------- Martinsville	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
637---------- Muskego	Poor	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
802*. Orthents									
865*. Pits									
2027C*: Miami----------	Fair	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Urban land.									
2152*: Drummer----------	Fair	Good	Good	Fair	Good	Good	Good	Fair	Good.
Urban land.									
2154A*: Flanagan----------	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.									

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

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	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
2171B*:									
Catlin	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Urban land.									
2198A*:									
Elburn	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.									
2236A*:									
Sabina	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.									
2481A*:									
Raub	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.									

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
23A, 23B---------- Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
27B---------- Miami	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, low strength.	Slight.
27C2---------- Miami	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
27D2---------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
27E2---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
56B---------- Dana	Moderate: rooting depth, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
73---------- Ross	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
91B---------- Swygert	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
102A---------- La Hogue	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
125---------- Selma	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
131B---------- Alvin	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
134B---------- Camden	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
146B---------- Elliott	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
148B---------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
149A---------- Brenton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
150B---------- Onarga	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
152--Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
153--Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
154A--Flanagan	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
171B--Catlin	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
194B--Morley	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
194C2--Morley	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
194D2--Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
198A--Elburn	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
199B--Plano	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
206--Thorp	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
219--Millbrook	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
221B--Parr	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Slight.
221C2--Parr	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
221D3--Parr	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
223B2--Varna	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
223C3--Varna	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: large stones, slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
232--Ashkum	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
233B--Birkbeck	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
234A--Sunbury	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
235--Bryce	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding, too clayey.
236A--Sabina	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
241D--Chatsworth	Moderate: too clayey, dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: droughty, too clayey.
242A--Kendall	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
243B--St. Charles	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
291B--Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
302--Ambraw	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
322C2--Russell	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
330--Peotone	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
387B--Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
387C3--Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
398A--Wea	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
402--Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Severe: wetness.
440B--Jasper	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
440C2--Jasper	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
448B--Mona	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
481A--Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
490A--Odell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
533* Urban land						
570B--Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
570C2--Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
570D2--Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
637--Muskego	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding.
802*. Orthents						
865*. Pits						
2027C*: Miami	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
Urban land.						
2152*: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Urban land.						
2154A*: Flanagan	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
Urban land.						
2171B*: Catlin	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2198A*:						
Elburn	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
2236A*:						
Sabina	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
2481A*:						
Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
23A, 23B---------- Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
27B---------- Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight----------	Fair: too clayey.
27C2---------- Miami	Severe: percs slowly.	Severe: slope.	Slight----------	Fair: too clayey.
27D2---------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Fair: too clayey, slope.
27E2---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: slope.
56B---------- Dana	Severe: wetness, percs slowly.	Severe: wetness.	Slight----------	Fair: too clayey, wetness.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.
73---------- Ross	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Good.
91B---------- Swygert	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
102A---------- La Hogue	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness.
125---------- Selma	Severe: ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
131B---------- Alvin	Slight----------	Severe: seepage.	Severe: seepage.	Fair: thin layer.
134B---------- Camden	Slight----------	Moderate: seepage, slope.	Slight----------	Fair: too clayey.
146B---------- Elliott	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
148B---------- Proctor	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.
149A---------- Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
150B---------- Onarga	Slight----------	Severe: seepage.	Severe: seepage.	Poor: thin layer.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
152--Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
153--Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
154A--Flanagan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
171B--Catlin	Severe: wetness.	Moderate: seepage, slope, excess humus.	Moderate: wetness.	Poor: hard to pack.
194B--Morley	Severe: wetness, percs slowly.	Severe: wetness.	Slight	Fair: too clayey, wetness.
194C2--Morley	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: slope.	Fair: too clayey, slope, wetness.
194D2--Morley	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope.
198A--Elburn	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
199B--Plano	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
206--Thorp	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
219--Millbrook	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
221B--Parr	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
221C2--Parr	Moderate: percs slowly.	Severe: slope.	Slight	Good.
221D3--Parr	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Fair: slope.
223B2--Varna	Severe: wetness, percs slowly.	Severe: wetness.	Slight	Fair: too clayey, wetness.
223C3--Varna	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: slope.	Fair: too clayey, slope, wetness.
232--Ashkum	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
233B---------- Birkbeck	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
234A---------- Sunbury	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
235---------- Bryce	Severe: ponding, percs slowly.	Slight----------	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
236A---------- Sabina	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
241D---------- Chatsworth	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Poor: too clayey, hard to pack.
242A---------- Kendall	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
243B---------- St. Charles	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
291B---------- Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
302---------- Ambraw	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
322C2---------- Russell	Moderate: percs slowly.	Severe: slope.	Slight----------	Fair: too clayey.
330---------- Peotone	Severe: ponding, percs slowly.	Slight----------	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
387B---------- Ockley	Slight----------	Severe: seepage.	Slight----------	Poor: small stones.
387C3---------- Ockley	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Poor: small stones.
398A---------- Wea	Slight----------	Moderate: seepage.	Slight----------	Fair: too clayey.
402---------- Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
440B---------- Jasper	Slight----------	Moderate: seepage, slope.	Slight----------	Fair: too clayey.
440C2---------- Jasper	Slight----------	Severe: slope.	Slight----------	Fair: too clayey.
448B---------- Mona	Severe: wetness, percs slowly.	Severe: wetness.	Slight----------	Poor: thin layer.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
481A---------- Raub	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
490A---------- Odell	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
533*. Urban land				
570B---------- Martinsville	Slight----------	Moderate: seepage, slope.	Slight----------	Fair: too clayey, thin layer.
570C2---------- Martinsville	Slight----------	Severe: slope.	Slight----------	Fair: too clayey, thin layer.
570D2---------- Martinsville	Moderate: slope.	Severe: slope.	Moderate: slope.	Fair: too clayey, slope, thin layer.
637---------- Muskego	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
802*. Orthents				
865*. Pits				
2027C*: Miami----------	Severe: percs slowly.	Severe: slope.	Slight----------	Fair: too clayey.
Urban land.				
2152*: Drummer----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Urban land.				
2154A*: Flanagan----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.				
2171B*: Catlin----------	Severe: wetness.	Moderate: seepage, slope, excess humus.	Moderate: wetness.	Poor: hard to pack.
Urban land.				
2198A*: Elburn----------	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Urban land.				

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
2236A*:				
Sabina	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.				
2481A*:				
Raub	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
23A, 23B Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
27B, 27C2 Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
27D2 Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
27E2 Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
56B Dana	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
67 Harpster	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
73 Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
91B Swygert	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
102A La Hogue	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
125 Selma	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
131B Alvin	Good	Probable	Improbable: too sandy.	Good.
134B Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
146B Elliott	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
148B Proctor	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
149A Brenton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
150B Onarga	Good	Probable	Improbable: too sandy.	Fair: area reclaim, thin layer.
152 Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
153 Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
154A Flanagan	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
171B---------- Catlin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
194B, 194C2---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
194D2---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
198A---------- Elburn	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
199B---------- Plano	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
206---------- Thorp	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
219---------- Millbrook	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
221B, 221C2---------- Parr	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
221D3---------- Parr	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
223B2, 223C3---------- Varna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
232---------- Ashkum	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
233B---------- Birkbeck	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
234A---------- Sunbury	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
235---------- Bryce	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
236A---------- Sabina	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
241D---------- Chatsworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
242A---------- Kendall	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
243B---------- St. Charles	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
291B---------- Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
302---------- Ambraw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
322C2---------- Russell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
330--- Peotone	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
387B, 387C3--- Ockley	Good---	Probable---	Probable---	Poor: small stones, area reclaim.
398A--- Wea	Good---	Probable---	Probable---	Fair: small stones.
402--- Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
440B, 440C2--- Jasper	Good---	Improbable: excess fines.	Improbable: excess fines.	Good.
448B--- Mona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
481A--- Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
490A--- Odell	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
533*. Urban land				
570B, 570C2--- Martinsville	Good---	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
570D2--- Martinsville	Good---	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
637--- Muskego	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
802*. Orthents				
865*. Pits				
2027C*: Miami---	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Urban land.				
2152*: Drummer---	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Urban land.				
2154A*: Flanagan---	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2154A*: Urban land.				
2171B*: Catlin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
2198A*: Elburn	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
2236A*: Sabina	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
2481A*: Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
23A---------- Blount	Slight---------	Moderate: piping, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
23B---------- Blount	Moderate: slope.	Moderate: piping, wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
27B, 27C2--------- Miami	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
27D2, 27E2-------- Miami	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
56B---------- Dana	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope----------	Erodes easily	Erodes easily.
67---------- Harpster	Moderate: seepage.	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
73---------- Ross	Severe: seepage.	Severe: piping.	Deep to water	Flooding-------	Favorable------	Favorable.
91B---------- Swygert	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Wetness, droughty, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, droughty.
102A---------- La Hogue	Severe: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness--------	Wetness, too sandy.	Wetness.
125---------- Selma	Moderate: seepage.	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
131B---------- Alvin	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
134B---------- Camden	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
146B---------- Elliott	Moderate: slope.	Moderate: piping, wetness.	Frost action, slope.	Wetness, slope.	Wetness--------	Wetness.
148B---------- Proctor	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
149A---------- Brenton	Moderate: seepage.	Severe: piping, wetness.	Frost action, cutbanks cave.	Wetness--------	Wetness, too sandy.	Wetness.
150B---------- Onarga	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, rooting depth, slope.	Soil blowing---	Rooting depth.
152---------- Drummer	Moderate: seepage.	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
153---------- Pella	Moderate: seepage.	Severe: piping, ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
154A---------- Flanagan	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
171B---------- Catlin	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Deep to water	Slope----------	Erodes easily	Erodes easily.
194B---------- Morley	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
194C2, 194D2------ Morley	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
198A---------- Elburn	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
199B---------- Plano	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Deep to water	Slope----------	Erodes easily	Erodes easily.
206---------- Thorp	Slight---------	Severe: ponding.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
219---------- Millbrook	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
221B, 221C2------- Parr	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
221D3---------- Parr	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
223B2---------- Varna	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
223C3---------- Varna	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
232---------- Ashkum	Slight---------	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
233B---------- Birkbeck	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
234A---------- Sunbury	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
235---------- Bryce	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, droughty, slow intake.	Ponding, percs slowly.	Wetness, droughty, rooting depth.
236A---------- Sabina	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
241D---------- Chatsworth	Severe: slope.	Moderate: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, percs slowly.	Slope, droughty.
242A---------- Kendall	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
243B---------- St. Charles	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
291B---------- Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
302---------- Ambraw	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness--------	Wetness.
322C2---------- Russell	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
330---------- Peotone	Slight---------	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
387B---------- Ockley	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
387C3---------- Ockley	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
398A---------- Wea	Moderate: seepage.	Moderate: thin layer.	Deep to water	Favorable------	Erodes easily	Erodes easily.
402---------- Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Flooding, wetness.	Wetness--------	Wetness.
440B, 440C2------- Jasper	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope----------	Favorable------	Favorable.
448B---------- Mona	Moderate: slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
481A---------- Raub	Slight---------	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
490A---------- Odell	Slight---------	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness, erodes easily.	Wetness, erodes easily.
533*. Urban land						
570B, 570C2------- Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope----------	Erodes easily	Erodes easily.
570D2---------- Martinsville	Severe: slope.	Severe: thin layer.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
637---------- Muskego	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, percs slowly.	Ponding--------	Wetness.
802*. Orthents						
865*. Pits						
2027C*: Miami----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Urban land.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
2152*:						
Drummer	Moderate: seepage.	Severe: ponding.	Ponding, frost action.	Ponding	Ponding	Wetness.
Urban land.						
2154A*:						
Flanagan	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
2171B*:						
Catlin	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Deep to water	Slope	Erodes easily	Erodes easily.
Urban land.						
2198A*:						
Elburn	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
2236A*:						
Sabina	Moderate: seepage.	Severe: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
2481A*:						
Raub	Slight	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

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	
23A, 23B--------- Blount	0-11	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	11-40	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	40-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
27B, 27C2, 27D2, 27E2---------- Miami	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-24	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	24-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	20-40	2-20
56B--------- Dana	0-12	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	30-35	8-12
	12-34	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-98	38-50	20-32
	34-39	Clay loam--------	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	37-50	17-30
	39-60	Loam----------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
67---------- Harpster	0-11	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	90-100	45-60	20-35
	11-41	Silty clay loam, silt loam, loam.	CL, CH	A-7	0	100	95-100	95-100	80-100	40-60	20-35
	41-60	Stratified loam to silt loam.	CL, CL-ML, SC, SM-SC	A-6, A-4, A-7	0	100	95-100	95-100	45-95	20-50	5-25
73---------- Ross	0-21	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	21-55	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
	55-63	Stratified gravelly sandy loam to loam.	CL, ML, SM, GM	A-6, A-4, A-2, A-1	0-5	65-100	55-100	35-100	20-80	<30	NP-12
91B---------- Swygert	0-12	Silty clay loam	CL, CH, ML	A-7, A-6	0	100	95-100	95-100	85-95	35-55	16-30
	12-38	Silty clay, clay	CH	A-7	0-5	95-100	95-100	90-100	75-95	50-60	25-35
	38-60	Silty clay loam, silty clay, clay.	CH, CL	A-7, A-6	0-5	85-100	80-100	80-100	75-95	35-65	15-40
102A---------- La Hogue	0-16	Loam----------	ML, CL, CL-ML	A-4	0	100	95-100	80-100	50-80	20-35	3-10
	16-43	Sandy clay loam, sandy loam, clay loam.	CL, SC	A-6, A-4	0	100	100	80-100	40-85	25-40	8-20
	43-73	Stratified sand to silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-2	0	90-100	80-100	50-95	20-60	<25	5-10
125---------- Selma	0-13	Loam----------	CL	A-4, A-6	0	100	98-100	80-98	55-85	25-35	7-17
	13-46	Sandy loam, loam, silty clay loam.	CL, SC	A-6	0	100	95-100	80-95	38-85	24-36	11-19
	46-73	Stratified sand to silt loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	90-100	85-100	60-90	30-70	15-35	5-20
131B---------- Alvin	0-20	Sandy loam-------	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	20-66	Loamy sand, loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
134B---------- Camden	0-14	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	14-35	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	35-62	Clay loam, sandy loam, loam.	ML, SC, SM, CL	A-2, A-4, A-6	0-5	90-100	85-100	60-90	30-70	20-40	3-15
	62-77	Stratified sandy loam to loam.	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
146B---------- Elliott	0-12	Silt loam--------	CL	A-6, A-4	0	95-100	95-100	95-100	80-100	30-40	8-18
	12-41	Silty clay, silty clay loam.	CH, CL	A-6, A-7	0-5	95-100	95-100	90-100	75-100	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
148B---------- Proctor	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	25-40	10-22
	14-44	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	95-100	90-100	85-100	65-90	25-50	10-25
	44-66	Stratified loam to sand.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0	85-100	80-100	50-100	25-80	20-40	5-20
149A---------- Brenton	0-16	Silt loam--------	CL, ML	A-6, A-4	0	100	95-100	95-100	80-100	30-40	8-15
	16-35	Silty clay loam	CL, ML	A-6, A-7	0	100	95-100	95-100	75-95	35-50	10-25
	35-60	Stratified loamy sand to silty clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6, A-2	0	95-100	85-100	80-100	30-85	20-35	5-20
150B---------- Onarga	0-12	Sandy loam-------	SC, SM, SM-SC	A-4, A-6, A-2	0	100	100	75-95	25-50	5-28	NP-12
	12-49	Sandy loam, loam, sandy clay loam. sandy clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4	0	95-100	95-100	75-95	30-60	19-32	5-14
	49-65	Stratified sand to sandy loam.	SM, SP-SM, SM-SC	A-2, A-4	0	85-100	80-100	70-95	12-50	<20	NP-6
152---------- Drummer	0-14	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	95-100	80-95	30-55	15-30
	14-41	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	41-47	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	47-60	Stratified sandy loam to silty clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
153---------- Pella	0-15	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	75-95	30-50	15-30
	15-26	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	95-100	85-100	75-95	30-50	15-30
	26-34	Stratified silty clay loam to sandy loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-90	25-45	10-25
	34-60	Stratified loamy sand to silty clay loam.	SM-SC, SC, CL, CL-ML	A-2, A-4, A-6	0-5	90-100	80-100	50-100	30-85	20-35	7-20
154A---------- Flanagan	0-18	Silt loam--------	CL	A-7, A-6	0	100	100	95-100	85-100	35-50	15-30
	18-45	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	45-60	Loam, clay loam, silt loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	0	85-100	80-100	70-95	36-85	20-45	5-30
171B---------- Catlin	0-13	Silt loam--------	ML, CL, OL	A-6, A-7	0	100	100	95-100	85-100	30-50	11-20
	13-44	Silty clay loam	CL, CH	A-7, A-6	0	100	100	90-100	80-100	35-55	20-30
	44-60	Loam, silt loam, clay loam.	CL	A-6, A-7	0	90-100	90-100	85-100	60-100	25-45	11-20

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
194B, 194C2, 194D2----------	0-6	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	85-95	25-40	5-15
Morley	6-10	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	10-34	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	34-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
198A----------	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-25
Elburn	16-46	Silty clay loam	CL	A-6, A-7	0	100	100	100	75-90	30-50	15-35
	46-60	Loam, sandy loam, sand.	CL, CL-ML, SC, SM-SC	A-6, A-4, A-2	0	90-100	80-100	60-90	25-80	20-40	5-20
199B----------	0-16	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	20-30	5-15
Plano	16-47	Silty clay loam	CL	A-6	0	100	100	95-100	95-100	25-40	10-25
	47-70	Stratified silt loam to sandy loam.	ML, SM, CL, SC	A-4, A-2	0-5	90-100	85-95	60-90	30-70	<25	NP-10
206----------	0-17	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	25-40	8-20
Thorp	17-53	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-95	30-50	10-25
	53-64	Loam, silt loam, clay loam.	CL	A-6, A-4, A-7	0	90-100	70-100	90-100	70-90	30-45	8-20
219----------	0-14	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	80-100	20-35	5-15
Millbrook	14-35	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-98	30-45	10-25
	35-60	Stratified sand to clay loam.	SM, SC, CL, ML	A-4, A-6, A-2	0-5	95-100	90-100	70-95	30-85	<30	NP-15
221B, 221C2------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	18-30	4-10
Parr	10-27	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	25-35	8-15
	27-60	Loam----------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<25	2-8
221D3----------	0-4		CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	30-35	10-15
Parr	4-20	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	25-35	8-15
	20-60	Loam----------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<25	2-8
223B2----------	0-11	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	95-100	85-95	25-40	8-20
Varna	11-31	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	85-100	85-98	80-98	35-56	15-29
	31-60	Silty clay loam, clay loam.	CL	A-7, A-6	0-10	95-100	85-100	85-98	80-95	30-45	13-26
223C3----------	0-8	Silty clay loam	CL	A-6, A-7	0-10	95-100	85-100	85-98	80-95	30-50	12-25
Varna	8-20	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	85-100	85-98	80-98	35-56	15-29
	20-60	Silty clay loam, clay loam.	CL	A-7, A-6	0-10	95-100	85-100	85-98	80-95	30-45	13-26
232----------	0-17	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	75-100	40-60	20-35
Ashkum	17-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	75-100	45-65	20-35
	39-60	Silty clay loam	CL	A-7, A-6	0-5	95-100	95-100	90-100	75-95	35-50	15-30
233B----------	0-11	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	95-100	28-40	5-15
Birkbeck	11-46	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	95-100	95-100	85-100	30-50	10-25
	46-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	70-100	55-80	25-45	5-20

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
234A---------- Sunbury	0-9	Silt loam--------	ML, CL, OL	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	8-15
	9-43	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-100	35-60	20-35
	43-65	Loam, silt loam, clay loam.	CL	A-4, A-6, A-7	0	98-100	95-100	90-100	70-100	30-45	8-20
235---------- Bryce	0-14	Silty clay-------	CH, CL	A-7	0	100	100	95-100	85-95	45-60	20-30
	14-50	Silty clay, clay	CH	A-7	0-5	95-100	95-100	95-100	75-95	50-60	25-35
	50-60	Silty clay, silty clay loam, clay.	CH, CL	A-7	0-5	95-100	90-100	90-100	75-95	40-65	20-40
236A---------- Sabina	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	13-42	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-100	35-50	11-25
	42-60	Loam, silty clay loam, silt loam.	CL	A-4, A-6, A-7	0-5	95-100	90-100	70-100	55-75	25-45	8-20
241D---------- Chatsworth	0-8	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	50-65	25-35
	8-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	90-100	45-75	20-45
242A---------- Kendall	0-18	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	20-35	5-15
	18-41	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	10-20
	41-60	Stratified sandy loam to silt loam.	CL, CL-ML, SM-SC, SC	A-2, A-4	0-5	90-100	80-90	60-90	30-70	<25	4-10
243B---------- St. Charles	0-8	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	95-100	22-35	7-15
	8-44	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	90-100	30-40	10-20
	44-60	Stratified silt loam to sandy loam.	SC, SM-SC, CL, CL-ML	A-2, A-4, A-6	0-5	90-100	80-90	60-90	30-70	15-35	5-15
291B---------- Xenia	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	10-37	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	37-57	Clay loam--------	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30
	57-72	Loam-------------	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15
302---------- Ambraw	0-15	Silty clay loam	ML, CL	A-6, A-7	0	100	100	85-95	70-95	35-45	10-18
	15-40	Clay loam, loam.	ML, CL	A-7, A-6	0	100	100	85-95	50-85	35-48	10-20
	40-60	Stratified clay loam to sand.	SC, ML, CL, SM	A-6, A-4	0	100	90-100	80-90	40-80	20-40	NP-17
322C2---------- Russell	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	11-29	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	29-51	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	51-72	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<30	2-14
330---------- Peotone	0-24	Silty clay loam	CH, CL	A-7	0	100	95-100	95-100	80-100	40-65	15-35
	24-46	Silty clay loam, silty clay.	CH, CL	A-7	0-5	100	95-100	90-100	85-100	41-70	17-39
	46-70	Silty clay loam, silt loam, silty clay.	CL, CH, ML, MH	A-7, A-6	0-5	95-100	95-100	90-100	75-98	30-60	14-29

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
387B---------- Ockley	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	10-35	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	35-45	Gravelly clay loam, clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	45-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
387C3---------- Ockley	0-6	Clay loam--------	CL	A-6, A-7	0	100	75-100	70-100	50-90	30-45	10-25
	6-14	Clay loam--------	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	14-41	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	41-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
398A---------- Wea	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	15-40	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-95	85-95	65-90	35-50	15-30
	40-62	Gravelly loam----	CL, SM-SC, SC, CL-ML	A-4, A-6	0-5	70-85	65-85	60-80	35-65	15-30	5-15
	62-70	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	0-10	---	NP
402---------- Colo	0-9	Silty clay loam	CL, CH	A-7, A-6	0	100	100	90-100	90-100	40-60	15-30
	9-65	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	90-100	90-100	40-60	20-30
440B, 440C2------ Jasper	0-12	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	12-24	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	100	80-95	45-85	20-35	10-20
	24-37	Sandy loam-------	SC, SM-SC	A-4, A-2-4	0	100	100	60-70	30-40	20-30	5-10
	37-60	Stratified silt to sand.	SC, CL-ML, CL, SM-SC	A-4	0	100	100	75-90	35-85	<30	5-10
448B---------- Mona	0-15	Silt loam--------	CL	A-4, A-6	0	100	95-100	95-100	85-100	25-40	8-20
	15-44	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0-5	95-100	85-95	75-90	60-85	35-50	11-25
	44-60	Silty clay, clay	CH, CL	A-7	0-10	95-100	85-95	80-95	75-90	40-60	15-32
481A---------- Raub	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	18-32	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	32-40	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	40-60	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
490A---------- Odell	0-11	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	70-95	30-40	8-14
	11-26	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	26-60	Loam, clay loam	CL, ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	25-40	2-16
533*. Urban land											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
570B---------- Martinsville	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	9-33	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	33-42	Silt loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	42-72	Stratified sand to sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
570C2, 570D2----- Martinsville	0-9	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	9-33	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	33-42	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	42-72	Stratified sand to sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
637---------- Muskego	0-16	Silty clay loam	MH, CH, CL	A-6, A-7	0	100	100	95-100	85-95	35-60	15-30
	16-50	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	50-70	Coprogenous earth	OH, OL	A-8	0	---	---	---	---	---	---
802*. Orthents											
865*. Pits											
2027C*: Miami----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-24	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	24-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	20-40	2-20
Urban land.											
2152*: Drummer---------	0-14	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	95-100	80-95	30-55	15-30
	14-41	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	41-47	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	47-60	Stratified sandy loam to silty clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
Urban land.											
2154A*: Flanagan--------	0-18	Silt loam--------	CL	A-7, A-6	0	100	100	95-100	85-100	35-50	15-30
	18-45	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	45-60	Loam, clay loam, silt loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	0	85-100	80-100	70-95	36-85	20-45	5-30
Urban land.											
2171B*: Catlin----------	0-13	Silt loam--------	ML, CL, OL	A-6, A-7	0	100	100	95-100	85-100	30-50	11-20
	13-44	Silty clay loam	CL, CH	A-7, A-6	0	100	100	90-100	80-100	35-55	20-30
	44-60	Loam, silt loam, clay loam.	CL	A-6, A-7	0	90-100	90-100	85-100	60-100	25-45	11-20
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
2198A*:											
Elburn----------	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-25
	16-46	Silty clay loam	CL	A-6, A-7	0	100	100	100	75-90	30-50	15-35
	46-66	Loam, sandy loam, sand.	CL, CL-ML, SC, SM-SC	A-6, A-4, A-2	0	90-100	80-100	60-90	25-80	20-40	5-20
Urban land.											
2236A*:											
Sabina----------	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	13-42	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-100	35-50	11-25
	42-60	Clay loam, silty clay loam, silt loam.	CL	A-4, A-6, A-7	0-5	95-100	90-100	70-100	55-75	25-45	8-20
Urban land.											
2481A*:											
Raub----------	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	18-32	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	32-40	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	40-60	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
23A, 23B---	0-11	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low---	0.43	3	6	2-3
Blount	11-40	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate---	0.43			
	40-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate---	0.43			
27B, 27C2, 27D2, 27E2---	0-8	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low---	0.37	5	5	.5-3
Miami	8-24	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate---	0.37			
	24-60	15-28	1.55-1.90	0.2-2.0	0.05-0.19	6.6-8.4	Moderate---	0.37			
56B---	0-12	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low---	0.32	5	5	3-5
Dana	12-34	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-6.0	Moderate---	0.43			
	34-39	27-35	1.45-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate---	0.43			
	39-60	15-27	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Low---	0.43			
67---	0-11	22-35	1.05-1.25	0.6-2.0	0.21-0.24	7.4-8.4	Moderate---	0.28	5	4L	5-6
Harpster	11-41	25-35	1.20-1.50	0.6-2.0	0.17-0.22	7.4-8.4	Moderate---	0.28			
	41-60	15-30	1.40-1.60	0.6-2.0	0.11-0.22	7.4-8.4	Low---	0.28			
73---	0-21	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low---	0.32	5	5	4-5
Ross	21-55	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low---	0.32			
	55-63	5-25	1.35-1.60	0.6-6.0	0.05-0.18	6.1-8.4	Low---	0.32			
91B---	0-12	27-42	1.25-1.50	0.2-0.6	0.18-0.22	5.6-6.5	Moderate---	0.43	3	7	4-5
Swygert	12-38	45-50	1.40-1.65	0.06-0.2	0.05-0.12	6.1-7.8	High---	0.32			
	38-60	38-60	1.60-1.75	<0.06	0.03-0.05	7.9-8.4	High---	0.32			
102A---	0-16	10-27	1.40-1.60	0.6-2.0	0.20-0.24	6.1-7.3	Low---	0.28	5	5	3-4
La Hogue	16-43	18-35	1.50-1.70	0.6-2.0	0.12-0.20	5.1-7.3	Moderate---	0.28			
	43-73	5-20	1.60-1.80	0.6-6.0	0.05-0.22	5.6-7.8	Low---	0.20			
125---	0-13	20-27	1.40-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low---	0.28	5	6	4-6
Selma	13-46	18-30	1.40-1.60	0.6-2.0	0.15-0.19	6.1-8.4	Moderate---	0.28			
	46-73	7-18	1.60-1.90	2.0-6.0	0.07-0.19	6.6-8.4	Low---	0.28			
131B---	0-20	10-15	1.45-1.65	2.0-6.0	0.14-0.20	5.1-6.5	Low---	0.24	5	3	.5-1
Alvin	20-66	15-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.0	Low---	0.24			
134B---	0-14	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low---	0.37	5	6	1-2
Camden	14-35	22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Moderate---	0.37			
	35-62	18-30	1.45-1.65	0.6-2.0	0.11-0.22	5.6-7.3	Low---	0.37			
	62-77	5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	Low---	0.37			
146B---	0-12	24-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Moderate---	0.28	4	6	4-5
Elliott	12-41	35-45	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.8	Moderate---	0.28			
	41-60	27-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Moderate---	0.28			
148B---	0-14	18-25	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low---	0.32	5	6	3-4
Proctor	14-44	25-35	1.20-1.45	0.6-2.0	0.15-0.20	5.6-6.5	Moderate---	0.43			
	44-66	15-32	1.40-1.70	0.6-6.0	0.07-0.19	6.1-7.3	Low---	0.43			
149A---	0-16	20-27	1.25-1.50	0.6-2.0	0.22-0.24	6.1-7.3	Low---	0.28	5	6	4-5
Brenton	16-35	25-35	1.30-1.55	0.6-2.0	0.18-0.20	5.6-7.3	Moderate---	0.28			
	35-60	15-30	1.50-1.70	0.6-2.0	0.11-0.20	6.1-8.4	Low---	0.28			
150B---	0-12	10-15	1.15-1.45	0.6-6.0	0.13-0.22	5.6-6.5	Low---	0.20	4	3	2-4
Onarga	12-49	15-18	1.45-1.70	0.6-6.0	0.15-0.19	5.1-6.5	Low---	0.20			
	49-65	2-10	1.65-1.90	6.0-20	0.05-0.13	5.1-7.8	Low---	0.15			
152---	0-14	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate---	0.28	5	7	5-7
Drummer	14-41	27-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate---	0.28			
	41-47	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate---	0.28			
	47-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	Low---	0.28			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
153----------	0-15	27-35	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	5-6
Pella	15-26	25-35	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate-----	0.28			
	26-34	15-30	1.35-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Moderate-----	0.28			
	34-60	15-30	1.40-1.70	0.6-2.0	0.10-0.22	7.4-8.4	Low----------	0.28			
154A----------	0-18	20-30	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6	4-5
Flanagan	18-45	35-42	1.35-1.55	0.2-0.6	0.15-0.22	5.6-7.3	High---------	0.43			
	45-60	20-30	1.45-1.70	0.2-0.6	0.15-0.22	6.1-8.4	Low----------	0.43			
171B----------	0-13	18-27	1.15-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	6	3-4
Catlin	13-44	27-35	1.25-1.55	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	44-60	20-30	1.40-1.70	0.6-2.0	0.07-0.11	6.1-8.4	Low----------	0.43			
194B, 194C2, 194D2----------	0-6	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	2-3
Morley	6-10	27-40	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.43			
	10-34	35-50	1.55-1.70	0.2-0.6	0.11-0.15	5.6-6.5	Moderate-----	0.43			
	34-60	27-40	1.60-1.80	0.06-0.6	0.07-0.12	6.6-8.4	Moderate-----	0.43			
198A----------	0-16	22-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	4-5
Elburn	16-46	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	46-60	15-25	1.50-1.70	0.6-6.0	0.12-0.18	6.1-8.4	Low----------	0.43			
199B----------	0-16	18-27	1.10-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	6	4-5
Plano	16-47	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	47-70	10-20	1.50-1.70	0.6-2.0	0.11-0.22	6.6-8.4	Low----------	0.43			
206----------	0-17	18-27	1.30-1.50	0.2-0.6	0.22-0.24	5.1-7.3	Low----------	0.37	4	6	3-5
Thorp	17-53	27-35	1.35-1.55	0.06-0.2	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	53-64	20-30	1.40-1.60	0.06-0.2	0.15-0.22	6.6-7.3	Low----------	0.37			
219----------	0-14	18-27	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	6	2-4
Millbrook	14-35	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.43			
	35-60	10-25	1.50-1.75	0.6-2.0	0.11-0.22	6.1-8.4	Low----------	0.32			
221B, 221C2------	0-10	12-22	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.32	5	5	3-5
Parr	10-27	20-30	1.40-1.55	0.6-2.0	0.15-0.19	5.6-6.5	Moderate-----	0.32			
	27-60	8-20	1.40-1.60	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.32			
221D3----------	0-4	25-30	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.32	4	5	1-2
Parr	4-20	20-30	1.40-1.55	0.6-2.0	0.15-0.19	5.6-6.5	Moderate-----	0.32			
	20-60	8-20	1.40-1.60	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.32			
223B2----------	0-11	20-30	1.10-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	4	6	3-4
Varna	11-31	35-48	1.30-1.60	0.06-0.6	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	31-60	27-40	1.50-1.70	0.2-0.6	0.14-0.20	6.6-8.4	Low----------	0.32			
223C3----------	0-8	27-35	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32	3	7	2-3
Varna	8-20	35-48	1.30-1.60	0.06-0.6	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	20-60	27-40	1.50-1.70	0.2-0.6	0.14-0.20	6.6-8.4	Low----------	0.32			
232----------	0-17	35-45	1.20-1.40	0.2-0.6	0.12-0.23	5.6-7.8	High---------	0.28	5	4	5-7
Ashkum	17-39	35-45	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.8	High---------	0.28			
	39-60	30-40	1.55-1.70	0.2-0.6	0.18-0.20	6.1-8.4	Moderate-----	0.28			
233B----------	0-11	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5	6	1-3
Birkbeck	11-46	25-35	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Moderate-----	0.37			
	46-70	20-30	1.40-1.60	0.6-2.0	0.14-0.20	5.6-7.8	Low----------	0.37			
234A----------	0-9	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	6	2-4
Sunbury	9-43	36-40	1.35-1.55	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	43-65	20-30	1.40-1.60	0.6-2.0	0.07-0.11	7.4-8.4	Low----------	0.43			
235----------	0-14	35-48	1.30-1.50	0.2-0.6	0.12-0.21	5.6-7.8	High---------	0.28	3	4	5-7
Bryce	14-50	42-48	1.35-1.60	0.06-0.2	0.09-0.13	6.6-8.4	High---------	0.28			
	50-60	38-60	1.60-1.75	0.06-0.2	0.03-0.05	7.4-8.4	High---------	0.28			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm3	In/hr	In/In	pH					Pct
236A----------	0-13	20-27	1.25-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
Sabina	13-42	35-42	1.35-1.55	0.2-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	42-60	25-35	1.40-1.60	0.2-2.0	0.07-0.11	7.4-8.4	Low----------	0.37			
241D----------	0-8	40-60	1.30-1.50	<0.06	0.06-0.07	5.6-7.8	Moderate-----	0.32	2	4	.5-1
Chatsworth	8-60	35-60	1.50-1.70	<0.06	0.05-0.07	6.1-8.4	Moderate-----	0.32			
242A----------	0-18	20-27	1.15-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
Kendall	18-41	27-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	41-60	10-25	1.55-1.70	0.6-2.0	0.11-0.22	5.1-8.4	Low----------	0.37			
243B----------	0-8	20-27	1.15-1.30	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5-4	6	1-3
St. Charles	8-44	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	44-60	10-25	1.55-1.75	0.6-2.0	0.11-0.22	5.6-7.8	Low----------	0.37			
291B----------	0-10	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	5	1-3
Xenia	10-37	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	37-57	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	57-72	20-27	1.55-1.90	0.2-2.0	0.05-0.19	7.9-8.4	Low----------	0.37			
302----------	0-15	25-35	1.40-1.60	0.6-2.0	0.17-0.23	5.6-7.3	Moderate-----	0.28	5	6	2-3
Ambraw	15-40	24-35	1.45-1.65	0.2-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	40-60	18-30	1.50-1.70	0.2-2.0	0.11-0.22	6.1-8.4	Low----------	0.28			
322C2---------	0-11	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.37	5	5	.5-2
Russell	11-29	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	29-51	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	51-72	14-30	1.60-1.80	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.37			
330----------	0-24	33-40	1.20-1.40	0.2-0.6	0.12-0.23	6.1-7.8	High---------	0.28	5	4	5-7
Peotone	24-46	35-45	1.30-1.60	0.2-0.6	0.11-0.20	6.1-7.8	High---------	0.28			
	46-70	25-42	1.40-1.65	0.2-0.6	0.18-0.20	6.6-8.4	High---------	0.28			
387B----------	0-10	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	1-3
Ockley	10-35	27-35	1.45-1.60	0.6-2.0	0.15-0.20	4.5-6.0	Moderate-----	0.37			
	35-45	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-6.5	Moderate-----	0.24			
	45-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
387C3---------	0-6	27-30	1.30-1.45	0.6-2.0	0.17-0.23	4.5-6.5	Moderate-----	0.37	4	7	.5-1
Ockley	6-14	27-35	1.45-1.60	0.6-2.0	0.15-0.20	4.5-6.0	Moderate-----	0.37			
	14-41	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-6.5	Moderate-----	0.24			
	41-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
398A----------	0-15	18-27	1.30-1.45	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.32	5	5	4-5
Wea	15-40	20-35	1.40-1.60	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.43			
	40-62	15-25	1.35-1.50	0.6-2.0	0.10-0.12	6.1-8.4	Low----------	0.24			
	62-70	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
402----------	0-9	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7	5-7
Colo	9-65	30-35	1.25-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28			
440B, 440C2------	0-12	10-22	1.30-1.45	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.28	5	5	3-5
Jasper	12-24	20-32	1.40-1.60	0.6-2.0	0.16-0.18	5.1-6.0	Low----------	0.28			
	24-37	12-20	1.40-1.60	0.6-2.0	0.14-0.16	5.6-7.3	Low----------	0.28			
	37-60	5-20	1.50-1.70	0.6-2.0	0.19-0.21	7.4-7.8	Low----------	0.28			
448B----------	0-15	20-27	1.10-1.30	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	4	6	3-5
Mona	15-44	25-35	1.35-1.55	0.2-0.6	0.15-0.20	6.1-7.8	Moderate-----	0.28			
	44-60	35-42	1.40-1.65	0.2-0.6	0.05-0.08	7.4-8.4	Moderate-----	0.28			
481A----------	0-18	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5	2-4
Raub	18-32	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	32-40	27-35	1.50-1.70	0.2-0.6	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	40-60	20-32	1.50-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
490A----------	0-11	20-27	1.30-1.50	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.28	5	5	4-5
Odell	11-26	25-35	1.50-1.70	0.2-0.6	0.15-0.19	5.6-6.5	Moderate-----	0.37			
	26-60	18-30	1.50-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Low----------	0.37			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
533*. Urban land											
570B, 570C2, 570D2---------- Martinsville	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	9-33	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	33-42	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-6.5	Low----------	0.24			
	42-72	3-23	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.24			
637---------- Muskego	0-16	27-35	0.80-1.10	0.6-2.0	0.15-0.23	6.1-7.3	High---------	0.28	5	7	7-19
	16-50	2-4	0.10-0.21	0.2-6.0	0.35-0.45	5.6-7.3	----------	----			
	50-70	---	0.10-0.40	0.06-0.2	0.18-0.24	6.6-8.4	----------	----			
802*. Orthents											
865*. Pits											
2027C*: Miami----------	0-8	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
	8-24	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate-----	0.37			
	24-60	15-28	1.55-1.90	0.2-2.0	0.05-0.19	6.6-8.4	Moderate-----	0.37			
Urban land.											
2152*: Drummer---------	0-14	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	14-41	27-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate-----	0.28			
	41-47	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-----	0.28			
	47-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	Low----------	0.28			
Urban land.											
2154A*: Flanagan--------	0-18	20-30	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6	4-5
	18-45	35-42	1.35-1.55	0.2-0.6	0.15-0.22	5.6-7.3	High---------	0.43			
	45-60	20-30	1.45-1.70	0.2-0.6	0.15-0.22	6.1-8.4	Low----------	0.43			
Urban land.											
2171B*: Catlin----------	0-13	18-27	1.15-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	6	3-4
	13-44	27-35	1.25-1.55	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	44-60	20-30	1.40-1.70	0.6-2.0	0.07-0.11	6.1-8.4	Low----------	0.43			
Urban land.											
2198A*: Elburn----------	0-16	22-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	4-5
	16-46	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	46-66	15-25	1.50-1.70	0.6-6.0	0.12-0.18	6.1-8.4	Low----------	0.43			
Urban land.											
2236A*: Sabina----------	0-13	20-27	1.25-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
	13-42	35-42	1.35-1.55	0.2-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	42-60	25-35	1.40-1.60	0.2-2.0	0.07-0.11	7.4-8.4	Low----------	0.37			
Urban land.											
2481A*: Raub----------	0-18	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5	2-4
	18-32	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	32-40	27-35	1.50-1.70	0.2-0.6	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	40-60	20-32	1.50-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
23A, 23B---- Blount	C	None----	---	---	1.0-3.0	Perched	Jan-May	High----	High----	High.
27B, 27C2, 27D2, 27E2---- Miami	B	None----	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
56B---- Dana	B	None----	---	---	3.0-6.0	Perched	Mar-Apr	High----	Moderate	Moderate.
67---- Harpster	B/D	None----	---	---	+.5-2.0	Apparent	Feb-Jun	High----	High----	Low.
73---- Ross	B	Occasional	Very brief	Mar-Jun	>6.0	---	---	Moderate	Low----	Low.
91B---- Swygert	C	None----	---	---	1.0-3.0	Apparent	Feb-May	High----	High----	Low.
102A---- La Hogue	B	None----	---	---	1.0-3.0	Apparent	Feb-Jun	High----	High----	Moderate.
125---- Selma	B/D	None----	---	---	+.5-2.0	Apparent	Mar-Jun	High----	High----	Low.
131B---- Alvin	B	None----	---	---	>6.0	---	---	Moderate	Low----	High.
134B---- Camden	B	None----	---	---	>6.0	---	---	High----	Low----	Moderate.
146B---- Elliott	C	None----	---	---	1.0-3.0	Perched	Mar-May	High----	High----	Moderate.
148B---- Proctor	B	None----	---	---	2.5-6.0	Apparent	Jan-May	High----	Moderate	Moderate.
149A---- Brenton	B	None----	---	---	1.0-3.0	Apparent	Mar-Jun	High----	High----	Moderate.
150B---- Onarga	B	None----	---	---	>6.0	---	---	Moderate	Low----	High.
152---- Drummer	B/D	None----	---	---	+.5-2.0	Apparent	Mar-Jun	High----	High----	Moderate.
153---- Pella	B/D	None----	---	---	+.5-2.0	Apparent	Mar-Jun	High----	High----	Moderate.
154A---- Flanagan	B	None----	---	---	1.0-3.0	Apparent	Apr-Jun	High----	High----	Moderate.
171B---- Catlin	B	None----	---	---	3.5-6.0	Apparent	Feb-May	High----	High----	Moderate.
194B, 194C2, 194D2---- Morley	C	None----	---	---	3.0-6.0	Perched	Mar-May	Moderate	High----	Moderate.
198A---- Elburn	B	None----	---	---	1.0-3.0	Apparent	Jan-May	High----	High----	Moderate.
199B---- Plano	B	None----	---	---	3.0-6.0	Apparent	Mar-May	High----	Moderate	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
206---------- Thorp	C/D	Occasional	Brief-----	Mar-Jun	+.5-2.0	Apparent	Feb-Jun	High-----	High-----	Moderate.
219---------- Millbrook	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
221B, 221C2, 221D3---------- Parr	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
223B2, 223C3------ Varna	C	None--------	---	---	3.0-6.0	Perched	Mar-May	High-----	Moderate	Moderate.
232---------- Ashkum	B/D	None--------	---	---	+1-2.0	Apparent	Apr-Jun	High-----	High-----	Moderate.
233B---------- Birkbeck	B	None--------	---	---	3.0-6.0	Apparent	Mar-May	High-----	High-----	Moderate.
234A---------- Sunbury	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
235---------- Bryce	D	None--------	---	---	+1-1.0	Apparent	Feb-Jun	High-----	High-----	Low.
236A---------- Sabina	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
241D---------- Chatsworth	D	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
242A---------- Kendall	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
243B---------- St. Charles	B	None--------	---	---	3.0-6.0	Apparent	Feb-Jun	High-----	Moderate	Moderate.
291B---------- Xenia	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	High-----	High-----	Moderate.
302---------- Ambraw	B/D	Occasional	Brief-----	Mar-May	0-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
322C2---------- Russell	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Moderate.
330---------- Peotone	B/D	None--------	---	---	+.5-1.0	Apparent	Feb-Jul	High-----	High-----	Moderate.
387B, 387C3------- Ockley	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
398A---------- Wea	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
402---------- Colo	B/D	Occasional	Brief-----	Mar-May	0-2.0	Apparent	Nov-Jul	High-----	High-----	Moderate.
440B, 440C2------- Jasper	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	High.
448B---------- Mona	B	None--------	---	---	2.5-4.0	Perched	Mar-Jun	Moderate	High-----	Moderate.
481A---------- Raub	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
490A---------- Odell	B	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
533*. Urban land										
570B, 570C2, 570D2---------- Martinsville	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
637---------- Muskego	A/D	None--------	---	---	+1-1.0	Apparent	Nov-Jun	High-----	Moderate	Moderate.
802*. Orthents										
865*. Pits										
2027C*: Miami----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Urban land.										
2152*: Drummer----------	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
Urban land.										
2154A*: Flanagan---------	B	None--------	---	---	1.0-3.0	Apparent	Apr-Jun	High-----	High-----	Moderate.
Urban land.										
2171B*: Catlin----------	B	None--------	---	---	3.5-6.0	Apparent	Feb-May	High-----	High-----	Moderate.
Urban land.										
2198A*: Elburn----------	B	None--------	---	---	1.0-3.0	Apparent	Jan-May	High-----	High-----	Moderate.
Urban land.										
2236A*: Sabina----------	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
Urban land.										
2481A*: Raub----------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

Soil name and location	Sample number	Horizon	Depth	Moisture density		Percentage passing sieve--				Percentage smaller than--				Liquid limit	Plasticity index	Classification	
				Max. dry density	Optimum moisture	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified
			In	Lb/ft3	Pct									Pct			
Catlin silt loam:																	
1,600 feet north of the southwest corner of sec. 19, T. 19 N., R. 9 E.	78-IL-10-9-1	Ap	0-10	97	21	100	100	98	91	75	70	35	26	38	15	A-6	CL
	78-IL-10-9-4	B21t	19-30	100	21	100	100	99	94	94	77	40	33	52	27	A-7-6	CH
	78-IL-10-9-8	IIC	57-66	122	12	94	93	84	63	58	50	29	20	26	11	A-6	CL
Colo silty clay loam:																	
600 feet north and 180 feet east of the southwest corner of sec. 11, T. 20 N., R. 7 E.	77-IL-10-28-1	A11	0-9	105	17	100	100	100	94	92	81	42	27	40	17	A-6	CL
	77-IL-10-28-3	A13	23-38	105	25	100	100	99	90	89	78	47	35	56	29	A-7-6	CH
Drummer silty clay loam:																	
300 feet north and 1,600 feet east of the southwest corner of sec. 19, T. 19 N., R. 9 E.	77-IL-10-34-1	Ap	0-7	97	23	100	99	95	83	79	70	42	31	53	26	A-7-6	CH
	77-IL-10-34-5	B22g	25-32	127	17	99	98	93	81	76	67	37	29	40	22	A-7-6	CL
	77-IL-10-34-8	IIC	47-60	123	12	96	93	80	55	50	44	26	19	26	11	A-7-6	CL
Flanagan silt loam:																	
85 feet north and 247 feet east of the center of SW1/4 sec. 19, T. 19 N., R. 9 E.	76-IL-10-22-1	A11	0-8	95	24	100	100	99	93	87	73	39	26	42	20	A-7-6	CL
	76-IL-10-22-5	B22t	23-32	97	20	100	100	98	94	93	77	42	36	51	26	A-7-6	CH
	76-IL-10-22-9	IIC	49-60	124	11	97	95	86	65	62	60	25	17	23	8	A-4	CL
Swygert silty clay loam:																	
280 feet south and 1,100 feet west of the northeast corner of sec. 8, T. 22 N., R. 14 W.	78-IL-10-4-1	Ap	0-7	99	21	100	100	98	91	84	70	34	28	35	11	A-6	ML
	78-IL-10-4-5	IIB22t	19-30	100	23	99	99	98	92	91	79	57	44	50	27	A-7-6	CH
	78-IL-10-4-7	IIC	38-60	113	16	86	83	80	75	73	69	44	31	38	16	A-6	CL

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
*Ambraw	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Ashkum	Fine, mixed, mesic Typic Haplaquolls
Birkbeck	Fine-silty, mixed, mesic Typic Hapludalfs
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Brenton	Fine-silty, mixed, mesic Aquic Argiudolls
Bryce	Fine, mixed, mesic Typic Haplaquolls
Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Catlin	Fine-silty, mixed, mesic Typic Argiudolls
Chatsworth	Fine, illitic, mesic Typic Eutrochrepts
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Dana	Fine-silty, mixed, mesic Typic Argiudolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Elburn	Fine-silty, mixed, mesic Aquic Argiudolls
Elliott	Fine, illitic, mesic Aquic Argiudolls
Flanagan	Fine, montmorillonitic, mesic Aquic Argiudolls
Harpster	Fine-silty, mesic Typic Calciaquolls
*Jasper	Fine-loamy, mixed, mesic Typic Argiudolls
Kendall	Fine-silty, mixed, mesic Aeric Ochraqualfs
La Hogue	Fine-loamy, mixed, mesic Aquic Argiudolls
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Millbrook	Fine-silty, mixed, mesic Udollic Ochraqualfs
Mona	Fine-loamy, mixed, mesic Typic Argiudolls
Morley	Fine, illitic, mesic Typic Hapludalfs
Muskego	Coprogenous, euic, mesic Limnic Medisaprists
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Odell	Fine-loamy, mixed, mesic Aquic Argiudolls
Onarga	Coarse-loamy, mixed, mesic Typic Argiudolls
Orthents	Loamy, mixed, nonacid, mesic Udorthents
Parr	Fine-loamy, mixed, mesic Typic Argiudolls
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Peotone	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Plano	Fine-silty, mixed, mesic Typic Argiudolls
Proctor	Fine-silty, mixed, mesic Typic Argiudolls
Raub	Fine-silty, mixed, mesic Aquic Argiudolls
*Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Sabina	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Selma	Fine-loamy, mixed, mesic Typic Haplaquolls
St. Charles	Fine-silty, mixed, mesic Typic Hapludalfs
Sunbury	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Swygert	Fine, illitic, mesic Aquic Argiudolls
Thorp	Fine-silty, mixed, mesic Argiaquic Argialbolls
Varna	Fine, illitic, mesic Typic Argiudolls
Wea	Fine-loamy, mixed, mesic Typic Argiudolls
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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