United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Illinois Agricultural
Experiment Station

Soil Survey of Whiteside County, Illinois

How To Use This Soil Survey

General Soil Map

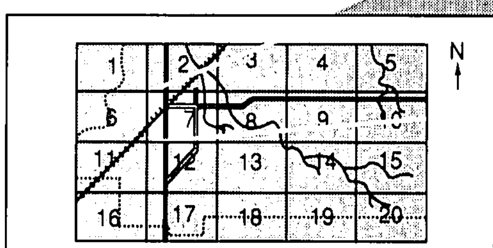
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

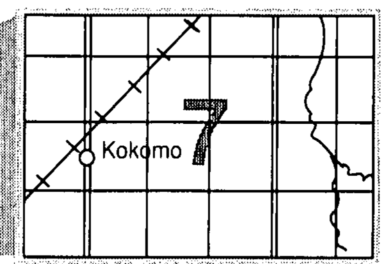
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



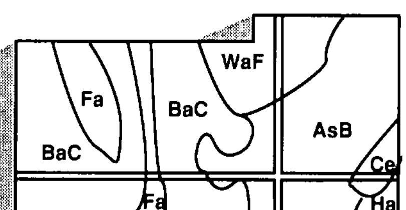
INDEX TO MAP SHEETS



MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.

MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

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.

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. 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 Whiteside County Soil and Water Conservation District. Financial assistance was provided by the Whiteside County Board of Supervisors and the Illinois Department of Agriculture.

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.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Contour stripcropping and grassed waterways in an area of the Seaton-Downs-Fayette general soil map unit.

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Issued March 1995

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Whiteside County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, 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 ensure 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 over 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.

Thomas W. Christenson
State Conservationist
Soil Conservation Service

Soil Survey of Whiteside County, Illinois

By L.R. Sabata, Soil Conservation Service

Soils surveyed by H.B. Main, L.R. Sabata, and R.A. Tegeler, Soil Conservation Service, and M.A. Kluz, Whiteside County

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

WHITESIDE COUNTY is in northwestern Illinois (fig. 1). It has an area of about 697 square miles, or 446,170 acres. In 1980, the population of the county was 65,970. Morrison is the county seat. Sterling and Rock Falls are the largest cities. The county is bordered by Carroll and Ogle Counties on the north, Ogle and Lee Counties on the east, Bureau and Henry Counties on the south, and Rock Island County and the Mississippi River on the west.

This survey updates a previous soil survey of Whiteside County published in 1928 *(10)*. It provides additional information and has larger maps, which show the soils in greater detail.

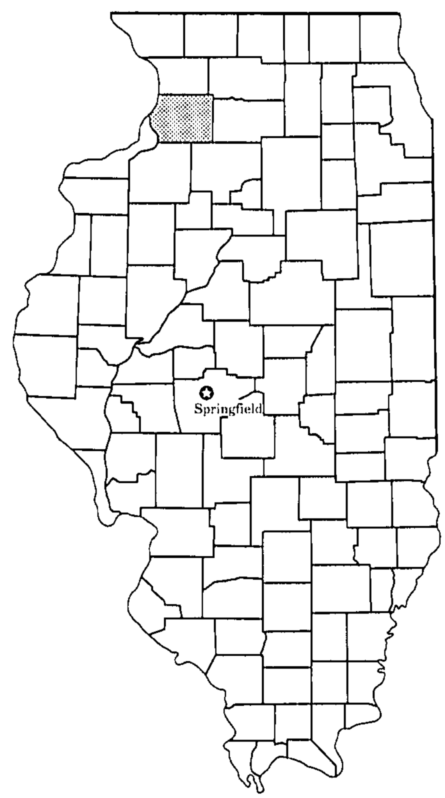

Figure 1.—Location of Whiteside County in Illinois.

General Nature of the County

This section provides general information about the county. It describes natural resources; physiography, relief, and drainage; history and development; agriculture; transportation facilities; and climate.

Natural Resources

In addition to soil, the most abundant natural resources in Whiteside County are sand, gravel, limestone, and water. Topsoil is mined commercially from the Cattail Channel bottom land (fig. 2). Sand, gravel, and limestone are mined in scattered areas throughout the county. The major areas of surface water in the county are the Mississippi and Rock Rivers and Lake Carlton. The wide upper pool formed by Lock

Figure 2.—A stockpile of topsoil that has been mined from the Cattail Channel bottom land.

and Dam No. 13 on the Mississippi River is an important area for commerce and recreation. The county has an abundant supply of ground water. The underlying limestone deposits in the northern part of the county and outwash deposits in the southern part are excellent sources of water for households, livestock, and irrigation.

Physiography, Relief, and Drainage

The landscape of Whiteside County is comprised of four major landforms: uplands, outwash plains, stream terraces, and flood plains. These landforms are the products of continental glaciation and more recent stream erosion. The deposition of glacial till and postglacial stream erosion have modified the original bedrock topography to create the present rolling terrain. The outwash plain consists of materials deposited by meltwater from the receding glacier. The flood plains and stream terraces are the result of the ongoing process of stream erosion. Stream courses have changed in the geologic past, resulting in several abandoned channels in the survey area *(3)*.

The uplands make up roughly the northern one-third to one-half of Whiteside County. They are divided by major stream channels and include the bluffs along the

Mississippi River and Rock River flood plains. The uplands generally consist of 5 or more feet of loess over glacial till and limestone bedrock, both of which are exposed at the surface in a few places along the steeper slopes. Elevations range from about 860 feet above sea level in the northeastern part of the county to about 600 feet above sea level near the base of the Mississippi River bluffs. Differences in local relief range to as much as 150 feet.

The southeastern part of the county south of the Rock River consists of a broad outwash plain. Stabilized sand dunes are common on the outwash plain. Smaller, scattered outwash areas also occur along some terraces. These formations were created where meltwater distributed sandy and loamy material westward from the receding glacial front to the east. Some parts of the outwash deposits were subsequently capped with a layer of loess, especially in the western half of the area. Elevations range from about 700 feet to 630 feet above sea level. Local relief is generally very low, but near the sand dunes it may be 30 to 70 feet.

The stream terraces are most extensive in the central part of the county immediately north of the Rock River flood plain. These areas are remnants of an old flood plain. Recent downcutting and channelization along the new flood plain has left the stream terrace positions at an elevation that is no longer subject to flooding. The terraces are often separated from the active flood plain by a short, steep slope called a terrace escarpment. Elevations range from about 730 feet to 610 feet above sea level. Local relief is generally very low, commonly less than 10 feet.

The flood plains in the county are along the Mississippi, Rock, and Green Rivers and their adjoining tributaries. These major streams have changed course in the geologic past. Meredosia Slough and Cattail Channel, which connect the bottom land along the Mississippi and Rock Rivers, are old stream channels. The narrow, bedrock-constricted Rock Creek flood plain north of Morrison is an area where recent channelization has occurred across a pre-existing valley divide *(3)*. Elevations on the flood plains range from about 680 feet above sea level along major creeks in the northern part of the county to about 570 feet above sea level in Meredosia Slough near the Mississippi River. Local relief is very low, generally less than 10 feet.

Whiteside County is within the Mississippi, Rock, and Green Rivers drainage basins. Cattail Creek and Johnson Creek drain into the Mississippi River. Major tributaries that drain into the Rock River are Rock Creek and Elkhorn Creek. The main tributary of the Green River, the Winnebago drainage ditch, joins the river in Lee County.

History and Development

Some of the earliest traces of human inhabitants in the survey area are earthen mounds in areas near Albany and Sterling. The mounds were made by Indians between 500 B.C. and 500 A.D. *(4)*.

When early French explorers and settlers came to the area, Sac, Fox, and Winnebago Indians were the main inhabitants *(4)*. The area was annexed by the United States as part of the Northwest Territory. When Illinois achieved statehood in 1818, the area was first organized as Madison County. In 1834, the first permanent white settlers arrived in what was then called Jo Daviess County *(5)*.

Whiteside County was established in 1836. It was named for Samuel Whiteside, a general in the militia who gained fame during the Blackhawk Indian War. Lyndon was the first county seat. In 1858, the county seat was moved to its present location in Morrison *(4)*.

Agriculture has long been the major enterprise in the county and supports much of the local economy. Manufacturing, especially steel, wire, and hardware products, is important in the Sterling-Rock Falls area. Other major industries in the county include communications and appliance control manufacturing.

Agriculture

In 1982, Whiteside County had 398,294 acres of farmland and 1,327 farms *(14)*. Corn was grown on 245,935 acres, and 62,054 acres was used for soybeans. Corn silage was harvested from 8,391 acres. About 7,442 acres was used for small grain, primarily oats and wheat. Approximately 20,711 acres was used for forage, and 11,165 acres was woodland.

In 1982, Whiteside County had 122,173 hogs and 63,934 head of cattle, including 3,943 dairy cows. About 1,807 sheep, 24,140 chickens, and 623 horses and ponies were also included in the livestock population.

Transportation Facilities

Whiteside County is served by State Highways 2, 5, 78, 88, 84, 136, and 172 and by U.S. Highway 30. Railroads furnish freight service to the area. Whiteside County Airport, south of Rock Falls, provides commercial air service. The Mississippi River and Lock and Dam No. 13 provide an excellent route for incoming and outgoing barge traffic (fig. 3). Barge terminals are at Albany and Fulton.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Morrison in the

Figure 3.—The Mississippi River provides commercial and recreational opportunities in Whiteside County.

period 1951 to 1980. 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 23.7 degrees F and the average daily minimum temperature is 14.5 degrees. The lowest temperature on record, which occurred on February 13, 1905, is -30 degrees. In summer, the average temperature is 72 degrees and the average daily maximum temperature is 83.2 degrees. The highest recorded temperature, which occurred on July 14, 1936, is 112 degrees.

Growing degree days are shown in table 1. They 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 (50 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.

The total annual precipitation is 36.14 inches. Of this, 23.89 inches, or about 66 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 29.61 inches. The heaviest 1-day rainfall during the period of record was 6.10 inches on October 10, 1954.

The average seasonal snowfall is 30.7 inches. The greatest snow depth at any one time during the period of record was 36 inches. On the average, 48 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 63 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 69 percent of the time possible in summer and 46 percent in winter. The prevailing wind is from the west-northwest. Average windspeed is highest, 12.1 miles per hour, in April.

Tornadoes and severe thunderstorms strike occasionally. They are of local extent and of short duration and cause only sparse damage in narrow areas. Hailstorms sometimes occur during the warmer periods.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit.

Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas having a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit 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 map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map of Whiteside County joins with the general soil maps of Carroll, Ogle, Lee, Bureau, Henry, and Rock Island Counties. Some of the names of the map units in the surveys of these adjoining counties do not agree with those in the survey of Whiteside County because of differences in the extent of the major soils, differences in map scale, or conceptual changes in soil classification. The differences in the map unit names do not significantly affect the use of the maps for general planning. Three map units in the survey of Carroll County and two in the survey of Henry County were not used in the survey of Whiteside County because the extent of the major soils mapped was too small. Two map units in the survey of Rock Island County were not used in the survey of Whiteside County because the boundaries are along a natural physiographic change that occurs at the county line.

Soil Descriptions

1. Tama-Downs-Port Byron

Gently sloping and moderately sloping, moderately well drained and well drained, silty soils that formed in loess

This map unit consists of soils on broad, convex ridges and side slopes in the uplands. The native vegetation was mixed prairie grasses and scattered deciduous forest. Slopes range from 1 to 10 percent.

This map unit makes up about 12 percent of the county. It is about 20 percent Tama soils, 18 percent Downs soils, 13 percent Port Byron soils, and 49 percent minor soils.

Tama soils are moderately well drained. Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is very dark brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silty clay loam. The lower part is yellowish brown, mottled, friable silt loam.

Downs soils are moderately well drained. Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silty clay loam; yellowish brown, mottled, friable silty clay loam; and yellowish brown, mottled, friable silt loam.

Port Byron soils are well drained. Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, the next part is dark yellowish brown and yellowish brown, and the lower part is yellowish brown and mottled.

Of minor extent in this map unit are Lamont, Lawson, Sable, Tell, and Waukegan soils. The gently sloping to steep Lamont soils formed in loamy and sandy sediments reworked by the wind. They are on adjacent slopes. The gently sloping to strongly sloping Tell soils formed in loess and sandy outwash on adjacent slopes. The somewhat poorly drained Lawson soils are in narrow areas on adjoining bottom land. They are frequently flooded. The poorly drained Sable soils are in low areas. They are subject to ponding. The nearly level to moderately sloping Waukegan soils formed in loess and sandy outwash on adjacent slopes.

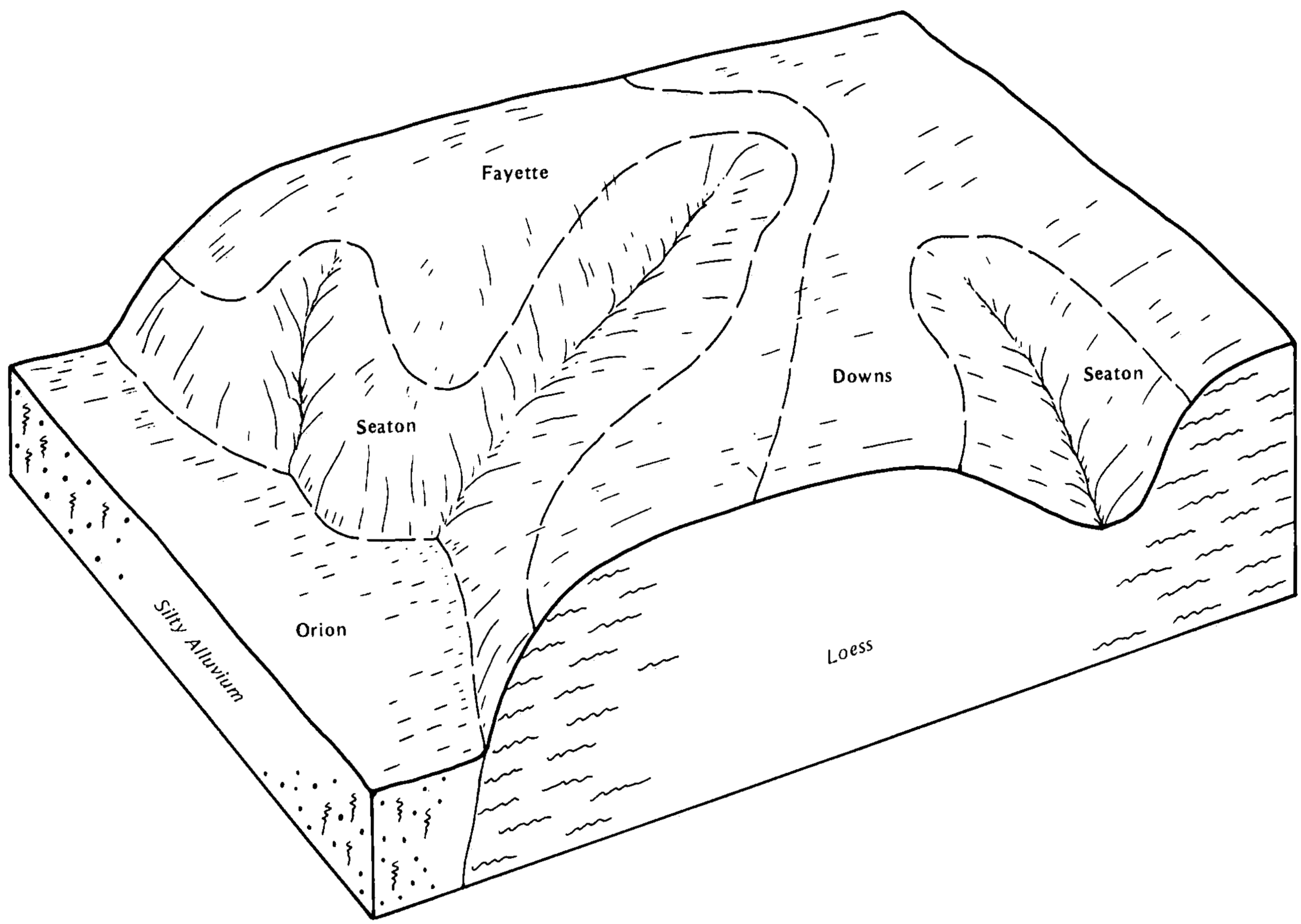

Figure 4.—Typical pattern of soils and parent material in the Seaton-Downs-Fayette general soil map unit.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. The main management concerns are controlling water erosion and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, wetness, the slope, seepage, and the shrink-swell potential are management concerns. Frost action and low strength are management concerns in areas used for local roads and streets.

2. Seaton-Downs-Fayette

Gently sloping to steep, well drained and moderately well drained, silty soils that formed in loess

This map unit consists of soils on narrow, convex ridges and side slopes in the uplands (fig. 4). The native vegetation was primarily deciduous forest and some mixed prairie grasses. Slopes range from 2 to 35 percent.

This map unit makes up about 20 percent of the county. It is about 34 percent Seaton soils, 10 percent Downs soils, 10 percent Fayette soils, and 46 percent minor soils.

Seaton soils are on gently sloping and moderately sloping ridges and strongly sloping to steep side slopes. They are well drained. Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, and the lower part is yellowish brown.

Downs soils are on gently sloping ridges and moderately sloping side slopes. They are moderately well drained. Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silty clay loam; yellowish brown, mottled, friable silty clay loam; and yellowish brown, mottled, friable silt loam.

Fayette soils are on gently sloping ridges and moderately sloping side slopes. They are well drained. Typically, the surface layer is brown, friable silt loam about 6 inches thick. It contains fragments of yellowish brown silty clay loam from the subsoil. The subsoil is about 37 inches thick. The upper part is yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown, friable silt loam.

Of minor extent in this map unit are Lamont, Lawson, Orion, Tell, Wakeland, and Woodbine soils. The somewhat poorly drained Orion, Lawson, and Wakeland soils are in narrow areas on adjoining bottom land. They are frequently flooded. Woodbine soils are slowly permeable in the lower part of the subsoil and are 40 to 60 inches deep over limestone bedrock. They are downslope from the major soils. Lamont soils formed in loamy and sandy sediments reworked by the wind. They are on adjacent slopes. Tell soils formed in loess and sandy outwash on adjacent slopes.

Most areas of this unit are used for cultivated crops, hay, or pasture. The gently sloping and moderately sloping areas are suited to cultivated crops. The strongly sloping areas are better suited to a crop rotation that includes a forage crop or to permanent hay and pasture. The moderately steep and steep areas are best suited to pasture and woodland. The main management concerns are controlling water erosion and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, wetness, seepage, the shrink-swell potential, and the slope are management concerns. Low strength, frost action, and the slope are management concerns in areas used for local roads and streets.

3. Richwood-Elburn-Drummer

Nearly level to moderately sloping, well drained, somewhat poorly drained and poorly drained, silty soils that formed in loess and in the underlying loamy, stratified sediments

This map unit consists of soils on outwash plains and stream terraces. The native vegetation was prairie grasses, marsh grasses, and sedges. Slopes range from 0 to 10 percent.

This map unit makes up about 11 percent of the county. It is about 54 percent Richwood and similar soils, 20 percent Elburn and similar soils, 14 percent Drummer soils, and 12 percent minor soils.

Richwood soils are gently sloping and moderately sloping and are well drained. Typically, the surface layer is very dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 12 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is strong brown, mottled, friable, stratified fine sandy loam and loamy sand.

Elburn soils are nearly level and somewhat poorly drained. Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, mottled, friable silt loam; yellowish brown and brown, mottled, friable silty clay loam; pale brown, mottled, friable silt loam; and pale brown, mottled, friable, stratified silt loam and loam.

Drummer soils are nearly level and poorly drained. Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is black, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. It is mottled. The upper part is gray, and the lower part is olive gray. The substratum to a depth of 60 inches or more is light olive gray, mottled, friable, calcareous, stratified loam and silt loam.

Of minor extent in this map unit are Dickinson, Lamont, Lawson, and Thorp soils. The poorly drained Thorp soils are slowly permeable. They are in depressions and are subject to ponding. The somewhat poorly drained Lawson soils are in narrow areas on adjoining bottom land. They are frequently flooded. The well drained and somewhat excessively drained Dickinson soils formed in wind- or water-deposited, loamy or sandy sediments. They are in the slightly higher areas. The well drained Lamont soils formed in loamy and sandy sediments reworked by the wind. They are in sloping areas.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. The main management concerns are drainage, the hazard of water erosion, and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, wetness, seepage, the shrink-swell potential, and ponding are management concerns. Low strength, the ponding, and frost action are management concerns in areas used for local roads and streets.

4. Waukegan-Tell-Lamont

Nearly level to steep, well drained, silty and loamy soils that formed in loess and sandy outwash or in loamy and sandy sediments reworked by the wind

This map unit consists of soils on outwash plains and stream terraces. The native vegetation was prairie grasses and deciduous forest. Slopes range from 0 to 45 percent.

This map unit makes up about 7 percent of the county. It is about 18 percent Waukegan and similar soils, 16 percent Tell and similar soils, 16 percent Lamont and similar soils, and 50 percent minor soils.

Waukegan soils are nearly level to moderately sloping. Typically, the surface layer is very dark grayish brown, friable silt loam about 13 inches thick. The subsoil is about 22 inches thick. The upper part is brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable sandy loam. The substratum extends to a depth of 60 inches or more. The upper part is strong brown, loose loamy sand. The lower part is yellowish brown, loose sand.

Tell soils are gently sloping to strongly sloping. Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is about 27 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, friable loam. The lower part is yellowish brown, very friable loamy sand. The substratum extends to a depth of 60 inches or more. The upper part is yellowish brown, loose loamy sand, and the lower part is yellowish brown, loose fine sand.

Lamont soils are gently sloping to steep. Typically, the surface layer is brown, friable loam about 7 inches thick. It contains fragments of dark yellowish brown loam from the subsoil. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable loam and sandy loam. The next part is strong brown, very friable loamy sand and sandy loam. The lower part is strong brown, loose sand that has thin bands of brown, very friable sandy loam.

Of minor extent in this map unit are Drummer, Joslin, Oakville, Ogle, Pecatonica, Plainfield, Port Byron, Prophetstown, Raddle, Seaton, Sparta, and Thorp soils and Joy soils that have a sandy substratum. Drummer and Thorp soils formed in loess over loamy, stratified sediments. They are in low areas and depressions and are subject to ponding. The somewhat poorly drained Joy soils formed in 40 to 60 inches of loess over sandy sediments. They are in low-lying, nearly level areas. The excessively drained Plainfield and Sparta soils formed in wind- and water-deposited sandy material. Oakville soils formed in wind-deposited sandy material in moderately sloping and strongly sloping areas. Ogle and Pecatonica soils formed in loess and in the underlying glacial till on adjacent slopes. Port Byron and Seaton soils formed entirely in loess. They are on adjacent slopes. Raddle soils formed in silty alluvium on adjacent stream terraces. The poorly drained Prophetstown soils formed in calcareous loess over loamy, stratified sediments. They are in low areas and are subject to ponding. Joslin soils formed in silty material and in the underlying lacustrine sediments on nearly level adjacent stream terraces.

Most areas of this unit are used for cultivated crops, hay, or pasture. The gently sloping and moderately sloping areas are suited to cultivated crops. The strongly sloping areas are better suited to a crop rotation that includes a forage crop or to permanent hay and pasture. The moderately steep and steep areas are best suited to pasture and woodland. The main management concerns are droughtiness, the hazard of water erosion, and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, the shrink-swell potential, the slope, a poor filtering capacity, and seepage are management concerns. Low strength, frost action, and the slope are management concerns in areas used for local roads and streets.

5. Sparta-Dickinson-Plainfield

Nearly level to moderately steep, excessively drained to well drained, sandy and loamy soils that formed in wind- and water-deposited, sandy and loamy sediments

This map unit consists of soils on outwash plains and stream terraces. The native vegetation was prairie grasses and some mixed deciduous forest. Slopes range from 0 to 25 percent.

This map unit makes up about 6 percent of the county. It is about 33 percent Sparta soils, 23 percent Dickinson soils, 10 percent Plainfield soils, and 34 percent minor soils.

Sparta soils are nearly level to moderately steep and are excessively drained. Typically, the surface layer is very dark grayish brown, very friable loamy sand about 18 inches thick. The subsoil also is very friable loamy sand. It is about 20 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of 60 inches or more is yellowish brown, loose sand.

Dickinson soils are nearly level and gently sloping and are well drained and somewhat excessively drained. Typically, the surface layer is very dark grayish brown and very dark brown, friable loam about 20 inches thick. The subsoil is about 16 inches thick. The upper part is brown, friable fine sandy loam. The next part is dark yellowish brown, very friable fine sandy loam. The lower part is dark yellowish brown, very friable loamy fine sand. The substratum to a depth of 60 inches or more is dark yellowish brown, loose fine sand.

Plainfield soils are gently sloping to moderately steep and are excessively drained. Typically, the surface layer is very dark grayish brown, very friable sand about 4 inches thick. The subsoil is dark yellowish brown and yellowish brown, loose sand about 22 inches thick. The substratum to a depth of 60 inches or more is strong brown, loose sand.

Of minor extent in this map unit are Gilford, Hoopeston, Lawler, Orio, Raddle, and Zumbro soils. The very poorly drained Gilford soils and the poorly drained Orio soils are in low areas and depressions and are subject to ponding. The somewhat poorly drained Hoopeston and Lawler soils are in the lower lying, nearly level areas. The well drained Raddle soils formed in silty alluvium on adjacent stream terraces. The well drained Zumbro soils are in areas of adjoining bottom land. They are subject to flooding.

Most areas of this unit are used for cultivated crops, hay, pasture, or coniferous trees. The nearly level and gently sloping areas are suited to cultivated crops. The moderately sloping to moderately steep areas are best suited to hay, pasture, and coniferous trees. The main management concerns are wind erosion, water erosion, droughtiness, and maintaining fertility.

If these soils are used as sites for buildings or sanitary facilities, a poor filtering capacity, seepage, and the slope are management concerns. Frost action and the slope are management concerns in areas used for local roads and streets.

6. Dickinson-Lawler

Nearly level and gently sloping, somewhat excessively drained, well drained, and somewhat poorly drained, loamy soils that formed in wind- or water-deposited, loamy and sandy sediments or in loamy sediments over sandy outwash

This map unit consists of soils on outwash plains and stream terraces (fig. 5). The native vegetation was prairie grasses. Slopes range from 0 to 7 percent.

This map unit makes up about 13 percent of the county. It is about 54 percent Dickinson and similar soils, 20 percent Lawler and similar soils, and 26 percent minor soils.

Dickinson soils are nearly level and gently sloping and are well drained and somewhat excessively drained. Typically, the surface soil is very dark grayish brown and very dark brown, friable loam about 20 inches thick. The subsoil is about 16 inches thick. The upper part is brown, friable fine sandy loam. The next part is dark yellowish brown, very friable fine sandy loam. The lower part is dark yellowish brown, very friable loamy fine sand. The substratum to a depth of 60 inches or more is dark yellowish brown, loose fine sand.

Lawler soils are nearly level and are somewhat poorly drained. Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 21 inches thick. The upper part is brown, mottled, friable silt loam. The lower part is grayish brown, mottled, friable loam. The substratum to a depth of 60 inches or more is brown and dark grayish brown, mottled, loose coarse sand.

Of minor extent in this map unit are Marshan and Orio soils. The poorly drained Orio soils and the very poorly drained Marshan soils are in low areas and depressions. They are subject to ponding.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. The main management concerns are wind erosion, water erosion, droughtiness, drainage, and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, wetness, a poor filtering capacity, and seepage are management concerns. Frost action is a management concern in areas used for local roads and streets.

7. Marshan-Prophetstown-Drummer

Nearly level, very poorly drained and poorly drained, loamy and silty soils that formed in loamy sediments over sandy outwash or in loess and loamy, stratified sediments

This map unit consists of soils in low areas on outwash plains. The native vegetation was marsh grasses and sedges. Slopes range from 0 to 2 percent.

This map unit makes up about 9 percent of the county. It is about 33 percent Marshan soils, 16 percent Prophetstown soils, 9 percent Drummer soils, and 42 percent minor soils.

Marshan soils are very poorly drained. Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is black, friable clay loam about 14 inches thick. The subsoil is gray and dark gray, mottled, friable loam about 11 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is grayish brown, loose coarse sand.

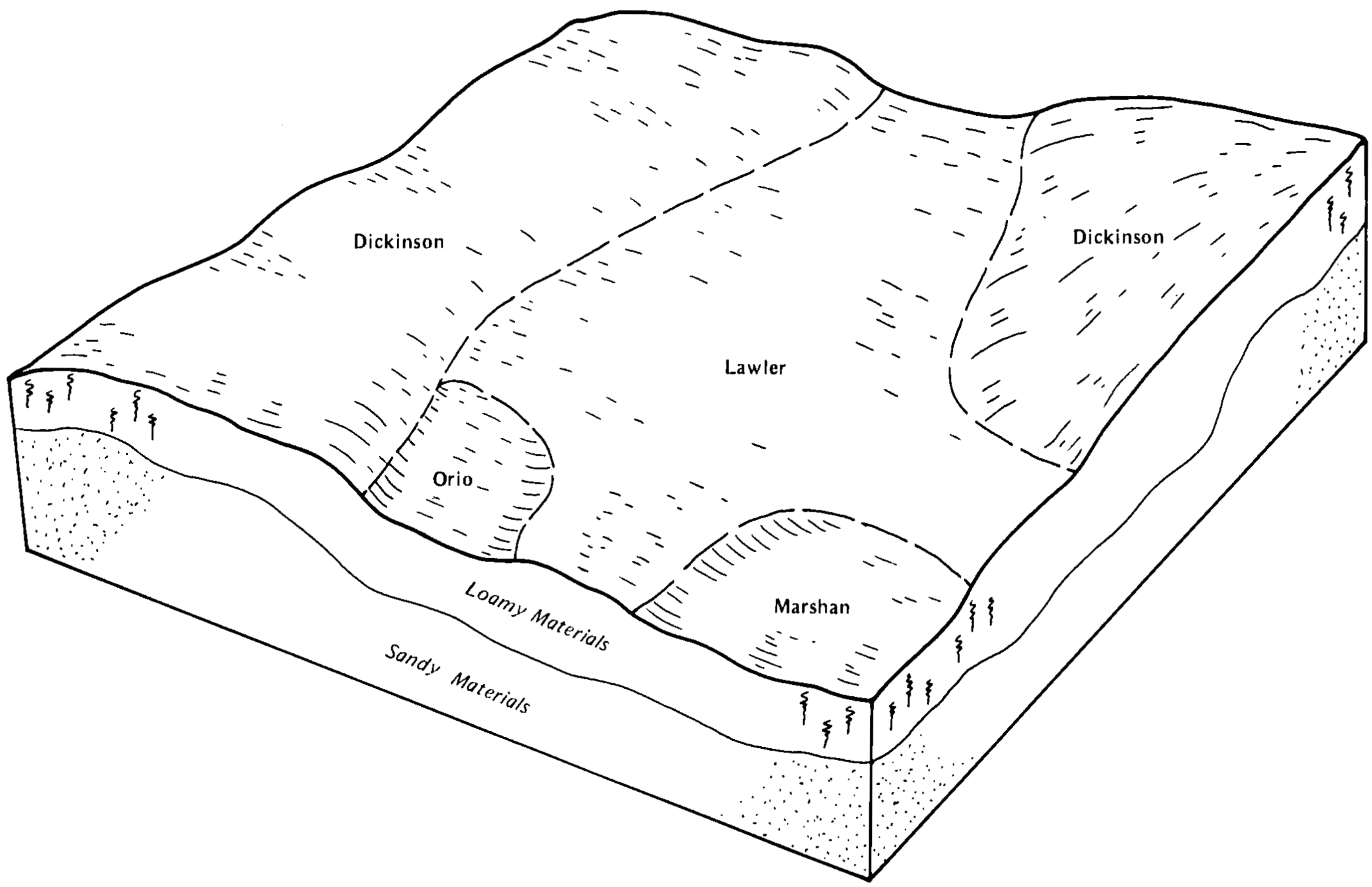

Figure 5.—Typical pattern of soils and parent material in the Dickinson-Lawler general soil map unit.

The lower part is pale brown, loose, calcareous sand.

Prophetstown soils are poorly drained. Typically, the surface layer is black, friable, calcareous silt loam about 9 inches thick. The subsurface layer is very dark gray, mottled, friable, calcareous silt loam about 7 inches thick. The subsoil is mottled, friable, calcareous silt loam about 24 inches thick. The upper part is dark grayish brown, and the lower part is light brownish gray. The substratum extends to a depth of 60 inches or more. It is mottled. The upper part is light brownish gray, friable, calcareous silt loam. The lower part is light gray, friable, calcareous, stratified loam, sandy loam, and silt loam.

Drummer soils are poorly drained. Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is black, friable silty clay loam about 8 inches thick. The subsoil is about 31 inches thick. It is mottled. In sequence downward, it is gray, friable silty clay loam; olive gray, friable silty clay loam; light olive gray, friable silt loam; and gray, friable silt loam. The substratum to a depth of 60 inches or more is light olive gray, mottled, friable, calcareous, stratified loam and silt loam.

Of minor extent in this map unit are Dickinson, Lawler, Udolpho, and Waukegan soils and Joy soils that have a sandy substratum. The somewhat excessively drained and well drained Dickinson soils and the well drained Waukegan soils are in the higher positions on the landscape. The somewhat poorly drained Joy, Lawler, and Udolpho soils are in the slightly higher positions. They are not subject to ponding.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. The main management concerns are drainage and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, ponding, a poor filtering capacity, and seepage are management concerns. Low strength, frost action, and the ponding are management concerns in areas used for local roads and streets.

8. Ambraw-Zumbro-Du Page

Nearly level and gently sloping, poorly drained, well drained, and moderately well drained, loamy and silty soils that formed in loamy or sandy alluvium

This map unit consists of soils on flood plains. The native vegetation was prairie grasses, marsh grasses, and sedges. Flooding is frequent to rare. Slopes range from 0 to 4 percent.

This map unit makes up about 20 percent of the county. It is about 33 percent Ambraw and similar soils, 10 percent Zumbro soils, 8 percent Du Page soils, and 49 percent minor soils.

Ambraw soils are nearly level and poorly drained. Typically, the surface layer is black, friable clay loam about 10 inches thick. The subsurface layer is very dark gray, mottled, friable clay loam about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark gray, mottled, friable clay loam. The next part is grayish brown, mottled, friable clay loam. The lower part is grayish brown, mottled, friable clay loam stratified with thin lenses of gray sandy clay loam. The substratum extends to a depth of 60 inches or more. It is friable and mottled. It is stratified grayish brown clay loam, very dark grayish brown sandy clay loam, and brown loamy sand.

Zumbro soils are gently sloping and well drained. Typically, the surface soil is about 25 inches thick. The upper part is very dark brown, friable sandy loam. The lower part is dark brown, very friable loamy sand. The subsoil is brown, very friable loamy sand about 9 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. It is mottled in the lower part.

Du Page soils are nearly level and moderately well drained. Typically, the surface layer is very dark gray, friable, calcareous silt loam about 9 inches thick. The subsurface layer is about 25 inches thick. The upper part is very dark grayish brown, friable, calcareous silt loam. The next part is very dark grayish brown, friable, calcareous loam. The lower part is dark brown, friable, calcareous loam. The substratum to a depth of 60 inches or more is dark grayish brown, friable, calcareous loam that has thin strata of brown sandy loam. It is mottled in the lower part.

Of minor extent in this map unit are Calco, Coffeen, Elvers, Houghton, Lawson, Medway, Millington, Orion, Riley, and Wakeland soils. The poorly drained Calco and Millington soils are calcareous. They are in landscape positions similar to those of the Ambraw soils. The somewhat poorly drained Coffeen, Lawson, Orion, Riley, and Wakeland soils are in the slightly higher positions. They are not subject to ponding. The moderately well drained Medway soils formed entirely in loamy alluvium. They are slightly lower on the landscape than the Zumbro soils. Elvers and Houghton soils are in the lower depressions. The poorly drained Elvers soils formed in silty alluvium over herbaceous organic deposits. The very poorly drained Houghton soils formed entirely in herbaceous organic deposits.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. Flooding normally does not interfere with crop production during the growing season, but in some years it may delay planting in the lower lying areas that are poorly drained. The main management concerns are drainage, wind erosion, droughtiness, and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, the flooding, ponding, a poor filtering capacity, and seepage are management concerns. Low strength, the ponding, and the flooding are management concerns in areas used for local roads and streets.

9. Selma

Nearly level, poorly drained, loamy soils that formed in loamy sediments over stratified, loamy outwash

This map unit consists of soils in low areas on outwash plains. The native vegetation was marsh grasses and sedges. The soils are subject to occasional flooding. Slopes range from 0 to 2 percent.

This map unit makes up about 2 percent of the county. It is about 68 percent Selma soils and 32 percent minor soils.

Typically, the surface layer of the Selma soils is black, friable loam about 9 inches thick. The subsurface layer is friable loam about 13 inches thick. The upper part is black, and the lower part is very dark gray and is mottled. The subsoil is friable loam about 23 inches thick. It is mottled. The upper part is dark gray, the next part is gray, and the lower part is light olive gray and dark gray. The substratum to a depth of 60 inches or more is mottled and very friable. It is stratified light brownish gray loamy sand and sandy loam and pale olive loam.

Of minor extent in this map unit are Canisteo, Lawler, and Udolpho soils. The somewhat poorly drained Lawler soils and the poorly drained Canisteo and Udolpho soils are in the slightly higher landscape positions. They are not subject to ponding or flooding.

Most areas of this unit are used for cultivated crops. These soils are suited to cultivated crops, hay, and pasture. The main management concerns are drainage and maintaining tilth and fertility.

If these soils are used as sites for buildings or sanitary facilities, ponding, flooding, and seepage are management concerns. Low strength, the ponding, and the flooding are management concerns in areas used for local roads and streets.

Broad Land Use Considerations

Most of the soils in Whiteside County are used for cultivated crops, primarily corn and soybeans. Some of the soils are used for pasture, woodland, urban development, recreational development, or wildlife habitat. The suitability of the soils for these uses varies significantly.

In areas used as cropland, water erosion is a management concern in general soil map units 1, 2, 3, 4, 5, and 6. Wind erosion is a management concern in map units 5, 6, and 8. Droughtiness is a management concern in map units 4, 5, 6, and 8, and drainage is a management concern in map units 3, 6, 7, 8, and 9. Flooding is a management concern in map units 8 and 9.

A small acreage of the county is used for pasture or hay, mainly in map units 2, 4, and 5. All of the soils in the county are suited to pasture. Drought-resistant species of legumes and grasses should be planted in map units 4, 5, 6, and 8. Species adapted to wetness should be selected for planting on the poorly drained soils in map units 3, 7, 8, and 9.

A small acreage is used as woodland, mainly in map units 2, 4, and 5. The woodland on the steeper slopes in map units 2 and 4 generally supports native deciduous trees. The woodland in map unit 5 generally supports coniferous trees that have been planted on the sandy soils to help control wind erosion. The main management concern in map units 2 and 4 is controlling competing vegetation. The main concerns in map unit 5 are wind erosion and droughtiness. Planting drought-resistant seedlings on the contour and in an established cover crop helps to control erosion.

A few areas in the county are used for urban development. General soil map units 3 and 6 are the most developed. The areas to be used for urban development should be carefully selected. The general soil map is helpful in planning general areas, but it cannot be used for selecting specific construction sites. The soils in all of the general soil map units have limitations that affect urban development. Some limitations can be overcome more easily than others. When areas are selected for urban development, the amount of prime farmland in a given area should be considered along with the limitations of the soils.

General soil map unit 7 is generally unsuited to urban development because of ponding, and map units 8 and 9 are generally unsuited because of flooding and ponding. Map units 1, 2, 3, 4, 5, and 6 are generally suited to urban development. Wetness is a management concern in map units 1, 2, 3, and 6. The shrink-swell potential and low strength are concerns in map units 1, 2, 3, and 4. A poor filtering capacity is a concern in map units 4, 5, and 6. The potential for frost action is a concern in map units 1, 2, 3, 4, 5, and 6. The slope is a concern in the steeper areas of map units 2, 4, and 5.

The suitability of the soils for recreational development ranges from poor to good, depending on the intensity of the expected use. Small areas suitable for intensive uses generally are available in all of the general soil map units. Map unit 6 is generally suited to all intensive recreational uses. Map unit 7 is poorly suited because of ponding. Map units 8 and 9 are poorly suited because of ponding and flooding. The steeper slopes in map units 1, 2, 3, 4, and 5 limit the suitability of the soils for intensive uses, such as playgrounds.

The suitability for wildlife habitat is good throughout the county. The main concern is maintaining suitable habitat for winter cover and nesting. At least some of the soils in all of the general soil map units are suited to openland wildlife habitat. Map units 2, 4, 5, and 6 are suited to woodland wildlife habitat, and map units 7, 8, and 9 are suited to 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 the heading "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 gives 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 substratum, 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 substratum. 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, Seaton silt loam, 2 to 5 percent slopes, is a phase of the Seaton series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Oakville-Tell complex, 4 to 10 percent slopes, eroded, 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. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

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

In the soil surveys of Carroll, Ogle, Lee, Henry, and Rock Island Counties, 33 soil series join with similar series that have different names in the survey of Whiteside County. Of these, 12 are in Carroll County, six are in Henry County, 13 are in Lee County, five are in Ogle County, and two are in Rock Island County. In Rock Island County, two map units identified as miscellaneous areas are classified as soil series in Whiteside County. Some of the map units in the adjacent counties that join map units of the same soil series in Whiteside County have different slope classes or erosion classes. These differences result from variations in the extent of the soils or conceptual changes in the soil classification system.

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

8E3—Hickory silty clay loam, 12 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on side slopes in the uplands. Individual areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is mixed dark yellowish brown and yellowish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable clay loam. The next part is yellowish brown, mottled, firm clay loam. The lower part is yellowish brown, mottled, firm, calcareous clay loam. In some places the subsoil contains less sand. In other places the surface layer has less clay and is thicker. In some areas on north- and east-facing slopes, the slope is greater than 18 percent. In other areas the subsoil contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion and Wakeland soils. These soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The content of organic matter is low. The shrink-swell potential is moderate. The potential for frost action also is moderate.

Most areas are used for hay or cultivated crops. This soil is generally unsuited to cultivated crops because of the erosion hazard. It is generally suited to hay and pasture. It is moderately suited to woodland and poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

Establishing pasture and hay crops helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to control erosion. Grazing should be deferred until the plants are sufficiently established. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

If this soil is used as a site for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome the slope on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

If this soil is used as a site for local roads and streets, low strength and the slope are limitations. Strengthening or replacing the base material helps to prevent damage. Cutting, filling, and land shaping help to overcome the slope.

The land capability classification is VIe.

8F2—Hickory silt loam, 18 to 35 percent slopes, eroded. This moderately steep and steep, well drained soil is on side slopes in the uplands. Individual areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, mottled, friable clay loam. The lower part is yellowish brown and light yellowish brown, mottled, friable, calcareous clay loam and loam. In some places the subsoil has less sand. In other places the surface layer is thicker. In some areas on north- and east-facing slopes, the slope is greater than 35 percent. In other areas the subsoil contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion and Lawson soils. These soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action also is moderate.

Most areas are used as woodland or pasture. This soil is moderately suited to woodland and pasture. It is generally unsuited to septic tank absorption fields, cultivated crops, and dwellings because of the slope. It is poorly suited to hay and to local roads and streets. It is suited to habitat for woodland wildlife.

Erosion control is needed during the establishment of grasses and legumes in the pastured areas. In areas where the pasture is established, interseeding legumes using a no-till system of seeding and seeding on the contour improve forage quality and help to control erosion. A permanent cover of pasture plants helps to control erosion and maintains tilth. Operating machinery is difficult on the steeper slopes. Selection of suitable species for planting, proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. Controlling fire and eliminating grazing of the woodland help to prevent the depletion of shrubs and sprouts, which provide food for wildlife.

If this soil is used as a site for local roads and streets, low strength and the slope are limitations. Strengthening or replacing the base material helps to prevent damage. Cutting, filling, and land shaping help to overcome the slope.

The land capability classification is VIe.

21C2—Pecatonica silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is yellowish brown, friable silt loam; strong brown, friable loam; strong brown, firm clay loam; and yellowish red, firm clay loam. In places the middle parts of the subsoil contain less sand. In some areas the surface layer and the upper part of the subsoil contain more sand. In other areas the middle and lower parts of the subsoil contain thin subhorizons of sand or loamy sand.

Included with this soil in mapping are small areas of Woodbine soils on the lower parts of the side slopes. These soils have limestone bedrock within a depth of 60 inches. They make up 5 to 10 percent of the unit.

Water and air move through the Pecatonica soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action also is moderate.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

36B—Tama silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on uplands. Individual areas are irregular in shape and range from 10 to 500 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is very dark brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silty clay loam. The lower part is yellowish brown, mottled, friable silt loam. In some places the surface layer is thinner. In other places the lower part of the subsoil contains more sand. In some areas a seasonal high water table is at a depth of 2 to 4 feet. In other areas the subsoil contains less clay. Some areas are nearly level.

Included with this soil in mapping are small areas of the poorly drained Sable soils in shallow depressions and drainageways. These soils make up 5 to 10 percent of the unit.

Water and air move through the Tama soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. The seasonal high water table also is a limitation on sites used for dwellings with basements. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface tile drains near the foundations lowers the water table on sites for dwellings with basements.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

36C2—Tama silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on side slopes along drainageways in the uplands. Individual areas are irregularly shaped or elongated and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. The upper part is brown and dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silty clay loam. The lower part is brown and yellowish brown, mottled, friable silt loam. In some areas the lower part of the subsoil is calcareous. In other areas the lower part of the subsoil contains more sand. In places the subsoil contains less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawson and well drained Huntsville soils in narrow drainageways. These soils are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the Tama soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. The seasonal high water table also is a limitation on sites used for dwellings with basements. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface tile drains near the foundations lowers the water table on sites for dwellings with basements.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

41—Muscatine silt loam. This nearly level, somewhat poorly drained soil is on flats near heads of drainageways in the uplands. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 7 inches thick. The subsurface layer is about 12 inches thick. The upper part is black, friable silt loam, and the lower part is very dark grayish brown, friable silty clay loam. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, friable silty clay loam. The next part is pale brown, mottled, friable silty clay loam. The lower part is pale brown and light brownish gray, mottled, friable silt loam. In some places the lower part of the subsoil contains more sand. In other places, the surface layer is thinner and the subsurface layer is lighter colored. In some areas the seasonal high water table is at a depth of more than 4 feet. In other areas the subsoil contains less clay.

Included with this soil in mapping are small areas of the poorly drained Sable soils. These soils are in low areas and are subject to ponding. Also included are a few small areas that have slopes of more than 2 percent and are subject to erosion. Included areas make up 5 to 10 percent of the unit.

Water and air move through the Muscatine soil at a moderate rate. Surface runoff is slow. The water table is at a depth of 2 to 4 feet during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps 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 subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or 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 site for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

49—Watseka loamy sand. This nearly level, somewhat poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is black, very friable loamy sand about 10 inches thick. The subsurface layer is very dark grayish brown, very friable loamy sand about 8 inches thick. The subsoil is dark grayish brown, very friable loamy sand about 6 inches thick. The substratum to a depth of 60 inches or more is loose sand. It is mottled. The upper part is grayish brown, and the lower part is light brownish gray. In places the soil contains more clay.

Included with this soil in mapping are small areas of the very poorly drained Gilford and excessively drained Sparta soils. Gilford soils contain more clay than the Watseka soil. They are in low areas and are subject to ponding. Sparta soils are in the slightly higher positions above the Watseka soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Watseka soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderately low. The water table is at a depth of 1 to 3 feet during the spring. The potential for frost action is moderate.

Most areas are used for cultivated crops (fig. 6). This soil is moderately suited to cultivated crops, hay, and pasture and to local roads and streets. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, wind erosion and droughtiness are management concerns. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after

Figure 6.—Sunflowers in an area of Watseka loamy sand. Sunflowers grow well in areas of this soil because they are tolerant of droughty conditions.

planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. Irrigation can supply additional moisture. The moderately low organic matter content influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay or pasture, wind erosion and droughtiness are management concerns, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Irrigation can supply additional moisture.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface drains around foundations lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation. The water table can be lowered by underground drains enclosed by filter or envelope material if suitable outlets are available. Diverting surface water from the filter bed helps to keep the system functioning properly. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The potential for frost action and the seasonal wetness are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIs.

54C—Plainfield sand, 3 to 12 percent slopes. This gently sloping to strongly sloping, excessively drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 2 to 60 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sand about 4 inches thick. The subsoil is dark yellowish brown and yellowish brown, loose sand about 22 inches thick. The substratum to a depth of 60 inches or more is strong brown, loose sand. In some places the surface soil is thicker and darker. In other places the soil contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Hoopeston soils. These soils are in low areas between dunes. They have a seasonal high water table at a depth of 1 to 3 feet. They make up 5 to 10 percent of the unit.

Water and air move through the Plainfield soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is very low.

Most areas are used for pasture, coniferous trees, or hay. This soil is generally unsuited to cultivated crops because of droughtiness and the hazard of wind erosion. It is poorly suited to pasture, hay, and septic tank absorption fields. It is moderately suited to coniferous trees. It is well suited to dwellings and to local roads and streets.

In areas used for pasture or hay, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion and water erosion are hazards. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. Irrigation can supply additional moisture. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion.

If this soil is used as woodland, seedling mortality and the equipment limitation are management concerns. They are caused by the low available water capacity. The seedling mortality rate can be reduced by planting nursery stock that is larger than is typical, by planting in furrows, or by mulching. Competing vegetation can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is VIs.

54E—Plainfield sand, 12 to 25 percent slopes. This moderately steep, excessively drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 2 to 60 acres in size.

Typically, the surface soil is dark brown, very friable sand about 4 inches thick. The subsoil is very friable sand about 35 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some places the surface soil is thicker and darker. In other places the soil contains more clay. In some areas on north- and east-facing slopes, the slope is greater than 25 percent.

Water and air move through this soil at a rapid rate. Surface runoff is medium. Available water capacity is low. The content of organic matter is very low.

Most areas are used for pasture or coniferous trees. This soil is generally unsuited to cultivated crops because of the hazard of wind erosion and droughtiness. It is poorly suited to pasture and hay. It is moderately suited to coniferous trees. It is poorly suited to dwellings and to local roads and streets. It is generally unsuited to septic tank absorption fields because of the slope and a poor filtering capacity.

In areas used for hay or pasture, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion and water erosion are hazards. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover.

If this soil is used as woodland, the erosion hazard, the equipment limitation, seedling mortality, and plant competition are management concerns. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting species that can withstand droughty conditions, by eliminating all competing vegetation near the seedlings, and by selecting the larger seedlings for planting. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The slope is a limitation on sites for dwellings and local roads and streets. Cutting, filling, and land shaping help to overcome this limitation.

The land capability classification is VIIs.

61—Atterberry silt loam. This nearly level, somewhat poorly drained soil is on flats near heads of drainageways in the uplands. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 9 inches thick. The subsoil is about 30 inches thick. The upper part is brown, mottled, friable silt loam. The next part is brown, pale brown, and yellowish brown, mottled, friable silty clay loam. The lower part is yellowish brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silt loam. In some places the subsoil contains less clay. In a few places the surface layer is lighter colored. In some areas the seasonal high water table is at a depth of more than 3 feet. In other areas the dark surface soil is more than 10 inches thick.

Included with this soil in mapping are small areas of the poorly drained Sable soils. These soils are in low areas that are subject to ponding. They make up 5 to 10 percent of the unit.

Water and air move through the Atterberry soil at a moderate rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is very high. The content of organic matter is moderate. The shrink-swell potential also is moderate. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

68—Sable silt loam. This nearly level, poorly drained soil is in low areas on uplands. It is subject to ponding for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is about 12 inches thick. The upper part is black, friable silt loam. The lower part is very dark gray, mottled, friable silty clay loam. The subsoil is about 27 inches thick. It is mottled. The upper part is dark gray, friable silty clay loam. The next part is grayish brown, friable silt loam. The lower part is olive gray, friable silt loam. The substratum to a depth of 60 inches or more is gray, mottled, friable silt loam. In a few places the lower part of the subsoil and the substratum contain more sand. In other places the seasonal high water table is at a depth of more than 2 feet. In a few places the soil has a light-colored subsurface layer. In some areas the dark surface soil is more than 24 inches thick. In other areas the lower part of the subsurface layer and the upper part of the subsoil contain less clay. In a few places the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are small areas of the well drained Port Byron soils. These soils are in the higher positions on the landscape. They make up 5 to 10 percent of the unit.

Water and air move through the Sable soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is very high. The content of organic matter is moderate. The shrink-swell potential also is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields and to dwellings because of the ponding.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

Low strength, the potential for frost action, and the ponding are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

69—Milford silty clay loam. This nearly level, poorly drained soil is in glacial lakebeds on outwash plains. It is subject to ponding for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is friable silty clay about 17 inches thick. The upper part is black, and the lower part is very dark gray. The subsoil is friable silty clay loam about 19 inches thick. It is mottled. The upper part is dark gray, and the lower part is olive gray. The substratum to a depth of 60 inches or more is light gray, mottled, friable silt loam that has a few thin strata of silt. In places the soil contains more clay throughout. In some areas the dark surface layer is less than 10 inches thick. In other areas the dark surface soil is more than 24 inches thick. In some places the surface layer is silt loam. In other places the subsoil contains subhorizons that are reddish brown or yellowish red.

Included with this soil in mapping are small areas of soils in the lower landscape positions. These soils are subject to occasional flooding. They make up 2 to 5 percent of the unit.

Water and air move through the Milford soil at a moderately slow rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is very high. The content of organic matter is high. The shrink-swell potential and the potential for frost action also are high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields and to dwellings because of the ponding and the restricted permeability.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

Low strength, the potential for frost action, and the ponding are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

81—Littleton silt loam. This nearly level, somewhat poorly drained soil is on terraces and alluvial fans. 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 8 inches thick. The subsurface layer is friable silt loam about 28 inches thick. The upper part is very dark gray, and the lower part is black. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is brown, friable silt loam, and the lower part is grayish brown, friable silty clay loam. In some places the soil contains more sand. In other places the seasonal high water table is at a depth of more than 3 feet.

Included with this soil in mapping are small areas of Lawson soils in narrow drainageways that are subject to localized flooding. Also included are a few small areas that have slopes of more than 2 percent and are subject to erosion. Included areas make up 5 to 10 percent of the unit.

Water and air move through the Littleton soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderate. The water table is at a depth of 1 to 3 feet during the spring. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility. Conservation practices are commonly needed in areas upslope from this soil to control runoff and siltation.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

87A—Dickinson loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 5 to 500 acres in size.

Typically, the surface soil is very dark grayish brown and very dark brown, friable loam about 20 inches thick. The subsoil is about 16 inches thick. The upper part is brown, friable fine sandy loam. The next part is dark yellowish brown, very friable fine sandy loam. The lower part is dark yellowish brown, very friable loamy fine sand. The substratum to a depth of 60 inches or more is dark yellowish brown, loose fine sand. In some areas the subsoil contains more sand. In a few areas the subsoil and substratum contain more clay. Some areas have a dark surface soil more than 24 inches thick. In some places the dark surface layer is less than 10 inches thick. In other places the subsoil contains thin subhorizons of reddish brown or yellowish red silty clay. In some areas the lower part of the subsoil and the substratum are calcareous.

Included with this soil in mapping are small areas of the very poorly drained Gilford and somewhat poorly drained Hoopeston soils. Gilford soils are in depressions and are subject to ponding. Hoopeston soils are slightly lower on the landscape than the Dickinson soil. Also included are a few small areas that have slopes of more than 1 percent and are subject to erosion. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Dickinson soil at a moderately rapid rate and through the lower part of the subsoil and the substratum at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderately low. The potential for frost action is moderate.

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

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation and wind erosion is a hazard. Irrigation can supply additional moisture (fig. 7). Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay or pasture, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion is a hazard. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Irrigation can supply additional moisture. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, frost action is a hazard. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIs.

87B2—Dickinson sandy loam, 2 to 7 percent slopes, eroded. This gently sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 4 to 50 acres in size.

Typically, the surface layer is very dark grayish

Figure 7.—Center-pivot irrigation in an area of Dickinson loam, 0 to 2 percent slopes.

brown, very friable sandy loam about 8 inches thick. It contains fragments of brown fine sandy loam from the subsoil. The subsoil is about 42 inches thick. The upper part is brown and yellowish brown, friable fine sandy loam. The next part is yellowish brown, very friable sandy loam. The lower part is strong brown, very friable loamy sand. The substratum to a depth of 60 inches or more is yellowish brown and strong brown, very friable loamy sand. In some places the surface layer is thicker. In other places the subsoil contains more sand. In a few places the subsoil contains more clay. In some areas the surface layer is lighter in color. In a few places the subsoil contains thin subhorizons of reddish brown or yellowish red silty clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Hoopeston soils in the lower, nearly level areas. These soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Dickinson soil at a moderately rapid rate and through the lower part of the subsoil and the substratum at a rapid rate. Surface runoff is medium. Available water capacity is low. The content of organic matter also is low. The potential for frost action is moderate.

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

If this soil is used for corn, soybeans, or small grain, wind erosion and water erosion are hazards and droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and no-till farming reduce soil losses and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. Irrigation can supply additional moisture. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for pasture or hay, wind erosion and water erosion are hazards and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion. Planting drought-resistant species of grasses and legumes on the contour can help in establishing vegetative cover. Irrigation can supply additional moisture.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, frost action is a hazard. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

88A—Sparta loamy sand, 0 to 3 percent slopes. This nearly level, excessively drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 18 inches thick. The subsoil is very friable loamy sand about 20 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In places the surface soil is lighter in color. In some areas the substratum contains gravel. In a few areas the dark surface soil is more than 24 inches thick. In some places limestone bedrock is within a depth of 60 inches. In other places the dark surface soil is less than 10 inches thick. Some areas contain more clay in the surface soil and the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Watseka soils. These soils are in the lower areas. They make up 5 to 10 percent of the unit.

Water and air move through the Sparta soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderately low.

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

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation and wind erosion is a hazard. Irrigation can supply additional moisture. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay and pasture, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion is a hazard. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Irrigation can supply additional moisture. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion.

If this soil is used as woodland, seedling mortality resulting from the low available capacity is a management concern. The seedling mortality rate can be reduced by planting nursery stock that is larger than is typical, by planting in furrows, or by mulching. Competing vegetation can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is IVs.

88C—Sparta loamy sand, 3 to 12 percent slopes. This gently sloping to strongly sloping, excessively drained soil is on outwash plains and stream terraces. Individual areas are long and narrow or irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 8 inches thick. The subsurface layer is dark brown, very friable loamy sand about 9 inches thick. The subsoil is about 16 inches thick. It is dark yellowish brown, very friable loamy sand in the upper part and yellowish brown, very friable sand in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the dark surface soil is less than 10 inches thick. In other areas the dark surface soil is more than 24 inches thick. In some places the surface soil and the subsoil are more than 24 inches thick. In other places the surface soil and the subsoil contain more clay. In a few areas limestone bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Watseka soils. These soils are in the lower, nearly level areas. They make up 2 to 5 percent of the unit.

Water and air move through the Sparta soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderately low.

Most areas are used for cultivated crops, hay, pasture, or coniferous trees. This soil is generally unsuited to cultivated crops because of droughtiness and wind erosion. It is poorly suited to hay and pasture and to septic tank absorption fields. It is well suited to dwellings and to local roads and streets. It is moderately suited to coniferous trees.

In areas used for pasture or hay, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion and water erosion are hazards. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. Irrigation can supply additional moisture. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion.

If this soil is used as woodland, seedling mortality resulting from the low available water capacity is a management concern. The seedling mortality rate can be reduced by planting nursery stock that is larger than is typical, by planting in furrows, or by mulching. Competing vegetation can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is VIs.

88E—Sparta loamy sand, 12 to 20 percent slopes. This moderately steep, excessively drained soil is on outwash plains and stream terraces. Individual areas are long and narrow or irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 9 inches thick. The subsurface layer is dark brown, very friable loamy sand about 8 inches thick. The subsoil is about 15 inches thick. It is dark yellowish brown, very friable loamy sand in the upper part and yellowish brown, very friable sand in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the dark surface soil is less than 10 inches thick. In other areas the surface soil and the subsoil contain more clay. In places the dark surface soil is more than 24 inches thick. In some areas on north- and east-facing slopes, the slope is greater than 20 percent.

Water and air move through the Sparta soil at a rapid rate. Surface runoff is medium. Available water capacity is low. The content of organic matter is moderately low.

Most areas are used for pasture or coniferous trees. This soil is generally unsuited to cultivated crops because of wind erosion, droughtiness, and the slope. It is poorly suited to hay and pasture, to dwellings, and to local roads and streets. It is moderately suited to coniferous trees. It is generally unsuited to septic tank absorption fields because of the slope and a poor filtering capacity.

In areas used for hay and pasture, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion and water erosion are hazards. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion.

If this soil is used as woodland, seedling mortality resulting from the low available water capacity is a management concern. The seedling mortality rate can be reduced by planting nursery stock that is larger than is typical, by planting in furrows, or by mulching. Competing vegetation can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The slope is a limitation on sites for dwellings and for local roads and streets. Cutting, filling, and land shaping help to overcome this limitation.

The land capability classification is VIIs.

98B—Ade loamy fine sand, 1 to 4 percent slopes. This gently sloping, somewhat excessively drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown, friable loamy fine sand about 10 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, friable loamy fine sand; dark yellowish brown, friable loamy fine sand; dark yellowish brown, friable fine sand that has thin bands of brown loam; and yellowish brown, friable fine sand that has thin bands of brown sandy loam and loamy sand. In places the surface soil is lighter in color. In some areas the lower part of the subsoil contains subhorizons of silt loam. In other areas the soil is fine sand throughout.

Included with this soil in mapping are small areas of the somewhat poorly drained Watseka soils. These soils are in the lower, nearly level areas. They make up 2 to 5 percent of the unit.

Water and air move through the Ade soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderately high.

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

If this soil is used for corn, soybeans, or small grain, wind erosion is a hazard and droughtiness is a limitation. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. Irrigation can supply additional moisture. The moderately high content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay and pasture, droughtiness is a limitation, particularly during the establishment of the plants, and wind erosion is a hazard. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion. Irrigation can supply additional moisture.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is IIIs.

104—Virgil silt loam. This nearly level, somewhat poorly drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 5 inches thick. The subsoil is about 41 inches thick. It is mottled. The upper part is brown, friable silty clay loam. The next part is brown and grayish brown, friable silty clay loam. The lower part is grayish brown, friable silt loam that has thin strata of loam. The substratum to a depth of 60 inches or more is brown, mottled, friable sandy loam. In places the lower part of the subsoil and the substratum are silt loam throughout and are not stratified. In a few areas the dark surface soil is more than 10 inches thick. In some places the seasonal high water table is at a depth of more than 3 feet. In other places the surface layer is lighter colored. In some areas the subsoil contains less clay. In other areas the substratum is sand or gravelly sand.

Included with this soil in mapping are small areas of the poorly drained Thorp soils. These soils are in slight depressions and are subject to ponding. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Virgil soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is high. The content of organic matter is moderate. The shrink-swell potential also is moderate. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action

are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

152—Drummer silt loam. This nearly level, poorly drained soil is in low areas on outwash plains. It is subject to ponding for brief periods from March through May. Individual areas are irregular in shape and range from 20 to 300 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is black, friable silty clay loam about 8 inches thick. The subsoil is about 31 inches thick. It is mottled. In sequence downward, it is gray, friable silty clay loam; olive gray, friable silty clay loam; light olive gray, friable silt loam; and gray, friable silt loam. The substratum to a depth of 60 inches or more is light olive gray, mottled, friable, calcareous, stratified loam and silt loam. In places the substratum is silt loam throughout and is not stratified. In a few places the dark surface soil is less than 10 inches thick. In some areas the soil contains more sand. In a few places the seasonal high water table is at a depth of more than 2 feet. In some areas the dark surface soil is more than 24 inches thick. In other areas the subsurface layer and the upper part of the subsoil contain less clay.

Included with this soil in mapping are a few areas along drainage ditches that are subject to rare flooding. These areas make up 2 to 5 percent of the unit.

Water and air move through the Drummer soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is very high. The content of organic matter is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, prevent surface compaction and crusting, and increase the rate of water infiltration.

Low strength, the potential for frost action, and the ponding are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

171B—Catlin silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is in the uplands. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 4 inches thick. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable clay loam. The substratum to a depth of 60 inches or more is yellowish brown, friable, calcareous loam. In some places the loamy material is within a depth of 40 inches. In other places the lower part of the subsoil and the substratum are silt loam. In some areas the dark surface soil is less than 10 inches thick. In a few places the seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn soils. These soils are in the lower, nearly level areas. They make up 5 to 10 percent of the unit.

Water and air move through the Catlin soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action

are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

171C2—Catlin silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It contains fragments of brown silty clay loam from the subsoil. The subsoil is about 43 inches thick. The upper part is yellowish brown, friable silty clay loam. The next part is yellowish brown, friable silt loam. The lower part is yellowish brown, firm, calcareous clay loam. The substratum to a depth of 60 inches or more also is yellowish brown, firm, calcareous clay loam. In some areas the loamy material is within a depth of 40 inches. In other areas the lower part of the subsoil and the substratum are silt loam. In a few places the seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are small areas of Huntsville soils and the somewhat poorly drained Lawson soils. These soils are in narrow drainageways that are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the Catlin soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

172—Hoopeston sandy loam. This nearly level, somewhat poorly drained soil is 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 black, very friable sandy loam about 10 inches thick. The subsurface layer is very dark grayish brown, very friable sandy loam about 4 inches thick. The subsoil is brown, mottled, very friable sandy loam about 24 inches thick. The substratum to a depth of 60 inches or more is pale brown, mottled, loose sand. In some places the subsoil contains more sand. In other places the subsoil has more clay. In some areas the seasonal high water table is at a depth of more than 3 feet.

Included with this soil in mapping are small areas of the well drained and somewhat excessively drained Dickinson soils and the very poorly drained Gilford soils. Dickinson soils are in the higher positions and are more droughty than the Hoopeston soil. Gilford soils are in low areas and are subject to ponding. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Hoopeston soil at a moderately rapid rate and through the substratum at a rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is moderate. The content of organic matter also is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, wind erosion is a hazard and droughtiness is a limitation. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. Irrigation can supply additional moisture. Subsurface drainage may be needed to allow for timely tillage in the spring. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

In areas used for hay and pasture, wind erosion is a hazard and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Irrigation can supply additional moisture.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface drains around foundations lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation. It can be overcome by installing underground drains enclosed by filter or envelope material if suitable outlets are available. Diverting surface water from the filter bed helps to keep the system functioning properly. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIs.

175B2—Lamont loam, 2 to 7 percent slopes, eroded. This gently sloping, well drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable loam about 7 inches thick. It contains fragments of dark yellowish brown loam from the subsoil. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable loam and sandy loam. The next part is strong brown, very friable loamy sand and sandy loam. The lower part is strong brown, loose sand that has thin bands of brown, very friable sandy loam. In some places the surface soil is thicker. In other places the surface layer is darker. In a few areas the subsoil contains less clay and more sand. In other areas the surface layer and the upper part of the subsoil are silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Hoopeston soils in the lower, nearly level areas. These soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Lamont soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is medium. Available water capacity is moderate. The content of organic matter is very low. The potential for frost action is moderate.

Most areas are used for cultivated crops. Some areas are used for hay and pasture. This soil is moderately suited to cultivated crops and coniferous trees. It is well suited to hay, pasture, septic tank absorption fields, and dwellings. It is moderately suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, water erosion is a hazard and droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and no-till farming reduce soil losses and conserve moisture. Irrigation can supply additional moisture. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

If this soil is used for hay and pasture, seeding drought-tolerant forage species, renovating on the contour, delaying grazing, using proper stocking rates, applying fertilizer, and using a system of rotation grazing help to control erosion and improve forage production. Irrigation can supply additional moisture.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

175D2—Lamont loam, 7 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes on outwash plains and stream terraces. Individual areas are irregularly shaped or long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable loam about 7 inches thick. It contains fragments of dark yellowish brown loam from the subsoil. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable loam. The next part is strong brown, very friable sandy loam and loamy sand. The lower part is strong brown, very friable loamy sand that has thin bands of brown sandy loam. In some places the surface soil is thicker. In other places the subsoil contains less clay and more sand. In a few places the surface layer and the upper part of the subsoil are silt loam. In some areas on north- and east-facing slopes, the slope is greater than 15 percent. In a few areas the subsoil is calcareous and contains subhorizons of silt.

Water and air move through the upper part of the Lamont soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is rapid. Available water capacity is moderate. The content of organic matter is very low. The potential for frost action is moderate.

Most areas are used for cultivated crops. Some areas are used for hay and pasture. This soil is poorly suited to cultivated crops. It is moderately suited to septic tank absorption fields, hay, pasture, dwellings, local roads and streets, and coniferous trees.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and droughtiness is a limitation. A crop rotation dominated by forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity and conserve moisture. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

If this soil is used for hay and pasture, seeding drought-tolerant forage species, renovating on the contour, delaying grazing, using proper stocking rates, applying fertilizer, and using a system of rotation grazing help to control erosion and improve forage production.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

If this soil is used as a site for local roads and streets, the slope and the potential for frost action are management concerns. Cutting, filling, and land shaping help to overcome the slope. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IVe.

175F—Lamont loam, 15 to 45 percent slopes. This moderately steep and steep, well drained soil is near valleys on the side slopes of outwash plains and stream terraces. Individual areas are elongated and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 4 inches thick. The subsurface layer is brown, very friable very fine sandy loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is yellowish brown, friable very fine sandy loam; yellowish brown, very friable fine sandy loam; strong brown, friable loam; dark yellowish brown, very friable fine sandy loam; and brown, loose, calcareous fine sand that has thin bands of strong brown loamy fine sand. In places the surface soil is thinner. In some areas the subsoil contains more sand and less clay. In other areas the soil contains more silt and clay and less sand throughout. In a few places the subsoil is calcareous throughout and contains subhorizons of silt.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion soils. These soils are in narrow areas on adjacent bottom land. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Lamont soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is rapid. Available water capacity is moderate. The content of organic matter is very low. The potential for frost action is moderate.

Most areas are used as woodland or pasture. This soil is suited to pasture, woodland, and woodland wildlife habitat. It is generally unsuited to septic tank absorption fields, hay, cultivated crops, dwellings, and local roads and streets because of the slope.

In areas used for pasture, erosion is a hazard and droughtiness is a limitation, particularly during the establishment of the plants. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. The use of machinery for pasture renovation may be limited because of the slope. Pasture rotation, delayed grazing, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of erosion.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. Controlling fire and eliminating grazing of the woodland help to prevent the depletion of shrubs and sprouts, which provide food for wildlife.

The land capability classification is VIIe.

198—Elburn silt loam. This nearly level, somewhat poorly drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, mottled, friable silt loam; yellowish brown and brown, mottled, friable silty clay loam; pale brown, mottled, friable silt loam; and pale brown, mottled, friable, stratified silt loam and loam. In some places the subsurface layer is lighter colored. In other places the lower part of the subsoil is silt loam throughout. In some areas the subsoil contains less clay. In a few areas the middle part of the subsoil contains more sand. In places the seasonal high water table is at a depth of more than 3 feet. Some areas have a substratum of sand or loamy sand within a depth of 60 inches. In a few areas the lower part of the subsoil is loamy glacial till.

Included with this soil in mapping are small areas of the poorly drained Drummer soils in low areas that are subject to ponding. Also included are a few small areas that have slopes of more than 2 percent and are subject to erosion. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Elburn soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

200—Orio loam. This nearly level, poorly drained soil is in depressions on outwash plains. It is subject to ponding for brief periods from March through May. Individual areas are oval or irregularly shaped and range from 2 to 80 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is mottled, friable loam about 11 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The subsoil is about 38 inches thick. It is mottled. The upper part is dark grayish brown, friable loam and clay loam. The next part is grayish brown, friable loam. The lower part is dark grayish brown and olive gray, friable sandy clay loam. The substratum to a depth of 60 inches or more is dark grayish brown, mottled, loose loamy sand. In some places the dark surface soil is thicker. In some areas the subsoil contains more sand. In other areas the seasonal high water table is at a depth of more than 2 feet.

Included with this soil in mapping are small areas that are subject to rare flooding. These areas make up 2 to 5 percent of the unit.

Water and air move through the subsoil of the Orio soil at a moderately slow rate and through the substratum at a rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is high. The content of organic matter is moderate. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the ponding and the potential for frost action are management concerns. Open ditches can be used to remove excess water. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IIw.

201—Gilford loam. This nearly level, very poorly drained soil is on outwash plains and stream terraces. It is subject to ponding for brief periods from March through May. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer also is black, friable loam. It is about 10 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable sandy loam about 14 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, loose sand. In some places the dark surface soil is more than 24 inches thick. In other places the soil contains more clay. In some areas the dark surface layer is thinner. A few areas have a seasonal high water table at a depth of more than 2 feet. In places the soil contains more sand.

Included with this soil in mapping are a few areas along drainage ditches that are subject to rare flooding. These areas make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Gilford soil at a moderately rapid rate and through the substratum at a rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is moderate. The content of organic matter also is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and a poor filtering capacity.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting. Droughtiness is a limitation in midsummer. Irrigation can supply additional moisture.

If this soil is used as a site for local roads and streets, the ponding and the potential for frost action are management concerns. Open ditches can be used to remove excess water. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IIw.

206—Thorp silt loam. This nearly level, poorly drained soil is in depressions on outwash plains and stream terraces. It is subject to ponding for brief periods from March through May. Individual areas are oval, irregularly shaped, or elongated and range from 5 to 300 acres in size.

Typically, the surface soil is friable silt loam about 19 inches thick. The upper part is black, and the lower part is dark gray. The subsoil is about 25 inches thick. The upper part is dark gray, mottled, friable silty clay loam. The next part is gray, mottled, friable silt loam. The lower part is dark gray, mottled, friable sandy loam that has thin strata of gray loam. The substratum extends to a depth of 60 inches or more. It is stratified dark gray sandy loam, grayish brown loamy sand, and gray loam. It is mottled and very friable. In some areas the substratum contains more sand. In other areas the dark part of the surface soil is thinner. In some places the seasonal high water table is at a depth of more than 2 feet. In other places the lower part of the subsoil and the substratum are silt loam throughout and are not stratified. In a few areas the surface soil and the subsoil contain more sand.

Included with this soil in mapping are a few areas along drainage ditches that are subject to rare flooding. These areas make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Thorp soil at a slow rate and through the lower part of the subsoil and the substratum at a moderately rapid rate. Surface runoff is very slow or ponded. Available water capacity is high. The content of organic matter also is high. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings because of the ponding. It is generally unsuited to septic tank absorption fields because of the ponding and the restricted permeability. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, prevent compaction and crusting, and increase the rate of water infiltration.

Low strength, the potential for frost action, and the ponding are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

233C2—Birkbeck silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is yellowish brown, friable silt loam; yellowish brown, friable silty clay loam; yellowish brown, mottled, friable silty clay loam; yellowish brown, mottled, friable silt loam; yellowish brown, mottled, firm clay loam; and yellowish brown, mottled, firm, calcareous clay loam. In places the loamy material is within a depth of 40 inches. In some areas the subsoil is silt loam throughout. In other areas the seasonal high water table is at a depth of more than 6 feet. In a few places the subsoil contains thin subhorizons of sand or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion soils. These soils are in narrow drainageways that are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Birkbeck soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is medium. The water table is at a depth of 3 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops and is well suited to hay, pasture, and woodland. It is moderately 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. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings with basements, the seasonal high water table and the shrink-swell potential are limitations. The shrink-swell potential also is a limitation on sites for dwellings without basements. Installing subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderately slow permeability are limitations. Installing subsurface tile drains higher on the side slopes than the absorption field helps to intercept seepage water. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderately slow permeability.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

261—Niota silt loam. This nearly level, poorly drained soil is on stream terraces. It is subject to ponding for brief periods from March through May. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is light brownish gray, mottled, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is grayish brown, firm silty clay. The next part is light brownish gray, firm silty clay loam. The lower part is light brownish gray, friable silt loam. The substratum to a depth of 60 inches or more is stratified light olive gray loam and light brownish gray loamy sand. It is mottled and very friable. In some places the dark surface soil is thicker. In other places the surface layer is lighter in color. In some areas the subsoil contains less clay. In other areas the surface soil and the subsoil contain more clay. In a few places the seasonal high water table is perched at a depth of more than 2 feet.

Included with this soil in mapping are small areas of the well drained Joslin soils. These soils are in the higher positions on terraces and contain less clay in the surface soil and the upper part of the subsoil than the Niota soil. Also included are a few small areas in the slightly lower positions near stream channels that are subject to occasional flooding. Included areas make up 5 to 10 percent of the unit.

Water and air move through the subsoil of the Niota soil at a very slow rate and through the substratum at a moderate rate. Surface runoff is very slow or ponded. Available water capacity is high. The content of organic matter is moderate. The seasonal high water table is 0.5 foot above to 2.0 feet below the surface during the spring. The shrink-swell potential is high. The potential for frost action also is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings because of the ponding and the high shrink-swell potential. It is generally unsuited to septic tank absorption fields because of the ponding and the very slow permeability. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, the shrink-swell potential, low strength, and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

262—Denrock silt loam. This nearly level, somewhat poorly drained soil is on stream terraces. Individual areas are irregular in shape and range from 10 to 300 acres in size.

Typically, the surface soil is very dark grayish brown and dark brown, friable silt loam about 13 inches thick. The subsoil is about 35 inches thick. In sequence downward, it is brown and reddish brown, friable silty clay loam; reddish brown, mottled, firm silty clay; brown, mottled, friable loam; and yellowish brown, mottled, friable sandy loam. The substratum to a depth of 60 inches or more is strong brown, mottled, loose sand. In places the subsoil contains less clay.

Included with this soil in mapping are small areas of the well drained Joslin and poorly drained Niota soils. Joslin soils are in the slightly higher positions on the landscape. Niota soils are in low areas that are subject to ponding. Also included are a few small areas in the slightly lower positions near stream channels that are subject to occasional flooding. Included areas make up 10 to 15 percent of the unit.

Water and air move through the subsoil of the Denrock soil at a very slow rate and through the substratum at a rapid rate. Surface runoff is slow. Available water capacity is high. The content of organic matter is moderately high. The water table is perched at a depth of 1 to 2 feet during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to dwellings and local roads and streets. It is generally unsuited to septic tank absorption fields because of the seasonal high water table and the very slow permeability.

In the areas used for corn, soybeans, or small grain, the seasonal high water table delays planting in some years. Surface ditches help to lower the water table if suitable outlets are available. Tilling when the soil is wet causes surface cloddiness and compaction. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Adding suitable fill material to raise the area above the surrounding ground level helps to divert surface water and reduces wetness.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIw.

268B—Mt. Carroll silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges in the uplands. Individual areas are irregular in shape and range from 5 to 200 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 to a depth of 60 inches or more is friable silt loam. The upper part is brown and dark yellowish brown, and the lower part is yellowish brown. In places the dark surface soil is more than 10 inches thick. Some areas have a seasonal high water table between depths of 4 and 6 feet. In some places the surface layer is lighter colored. In other places the subsoil contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils. These soils are in the lower, nearly level areas. They make up 5 to 10 percent of the unit.

Water and air move through the Mt. Carroll soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

268C2—Mt. Carroll silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on ridgetops and along drainageways in the uplands. Individual areas are irregularly shaped or elongated and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil is friable silt loam about 45 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown and is mottled. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some places the surface layer is lighter colored. In other places the surface soil is not eroded. Some areas have a seasonal high water table between depths of 4 and 6 feet. In places the substratum contains more sand or coarse silt.

Water and air move through the Mt. Carroll soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. The soil is suited to bromegrass, orchardgrass, tall fescue, and alfalfa. Deferred grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

The land capability classification is IIIe.

268D2—Mt. Carroll silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes in the uplands. Individual areas are elongated and range from 5 to 25 acres in size.

Typically, the surface layer is dark brown and very dark grayish brown, friable silt loam about 7 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil is friable silt loam about 47 inches thick. The upper part is brown, the next part is yellowish brown, and the lower part is yellowish brown and is mottled. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In places the surface layer is lighter colored. In some areas a seasonal high water table is between depths of 4 and 6 feet. In some places the substratum contains more sand or coarse silt. In a few areas the surface soil is thicker.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawson and Orion soils. These soils are in narrow drainageways that are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the Mt. Carroll soil at a moderate rate. Surface runoff is rapid. Available water capacity is very high. The content of organic matter is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes mostly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome the slope on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

274B—Seaton silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges in the uplands. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, and the lower part is yellowish brown. In places the surface layer is darker. Some areas have a seasonal high water table at a depth of 4 to 6 feet. In some places the surface layer is thinner. In other places the subsoil has more clay. In some areas the lower part of the subsoil contains more sand.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderately low. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

Adapted pasture and hay plants grow well on this soil. Overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the hazard of erosion. Proper stocking rates, rotation grazing, 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 woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

274C2—Seaton silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on ridgetops and side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 10 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil to a depth of 60 inches or more is yellowish brown, friable silt loam. In places the surface soil is not eroded. Some areas have a seasonal high water table between depths of 4 and 6 feet. In some places the subsoil contains more clay. In other places the surface layer is darker. In some areas the subsoil contains relict mottles. In other areas the lower part of the subsoil contains more sand.

Water and air move through the Seaton soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderately low. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

274D2—Seaton silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. It contains fragments of dark yellowish brown silt loam from the subsoil. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is dark yellowish brown, and the lower part is yellowish brown. In some areas the surface layer is darker. In other areas the surface soil is not eroded. In places the subsoil contains more clay. Some areas have a seasonal high water table between depths of 4 and 6 feet. In some areas on north- and east-facing slopes, the slope is greater than 15 percent. In some places the subsoil contains relict mottles. In other places the lower part of the subsoil contains more sand. In a few areas water and air move through the lower part of the subsoil at a moderately slow rate.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion and Wakeland soils. These soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Seaton soil at a moderate rate. Surface runoff is rapid. Available water capacity is very high. The content of organic matter is moderately low. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes mainly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

275—Joy silt loam. This nearly level, somewhat poorly drained soil is on flats near heads of drainageways in the uplands. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 6 inches thick. The subsoil is friable silt loam about 36 inches thick. It is mottled. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam. In some places the dark surface soil is more than 24 inches thick. In other places the seasonal high water table is at a depth of more than 4 feet. In some areas the dark surface layer is thinner. In a few areas the substratum contains more sand.

Included with this soil in mapping are small areas of the poorly drained Sable and well drained Port Byron soils. Sable soils are in low areas and are subject to ponding. Port Byron soils are in the slightly higher positions. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Joy soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderately high. The water table is at a depth of 2 to 4 feet during the spring. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

277B—Port Byron silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges in the uplands. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, the next part is dark yellowish brown and yellowish brown, and the lower part is yellowish brown and is mottled. In places the dark surface layer is thinner. Some areas have a seasonal high water table between depths of 4 and 6 feet. In some areas the dark surface soil is more than 24 inches thick. In other areas the lower part of the subsoil contains more sand. A few areas are nearly level.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils in the lower, nearly level areas. These soils make up 5 to 10 percent of the unit.

Water and air move through the Port Byron soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderately high. The potential frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

277C—Port Byron silt loam, 5 to 10 percent slopes. This moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregularly shaped or elongated and range from 5 to 25 acres in size.

Typically, the surface soil is friable silt loam about 16 inches thick. The upper part is very dark grayish brown, and the lower part is dark brown. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is dark yellowish brown, and the lower part is yellowish brown. In some places the dark surface layer is thinner. In other places the lower part of the subsoil contains more sand. In some areas a seasonal high water table is between depths of 4 and 6 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderately high. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

279B—Rozetta silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsurface layer is brown and dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, mottled, friable silty clay loam. The lower part is brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is brown, mottled, friable silt loam. In some areas the surface layer is darker. In other areas the seasonal high water table is at a depth of more than 6 feet. In places the subsoil contains less clay. In a few places the seasonal high water table is at a depth of 2 to 4 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is very high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

Adapted pasture and hay plants grow well on this soil. Overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the hazard of erosion. Proper stocking rates, rotation grazing, 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 woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings with basements, the seasonal high water table and the shrink-swell potential are limitations. The shrink-swell potential also is a limitation on sites for dwellings without basements. Installing subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

279C2—Rozetta silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on side slopes along upland drainageways. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silty clay loam from the subsoil. The subsoil is about 51 inches thick. The upper part is yellowish brown, friable silty clay loam. The next part is yellowish brown, mottled, friable silty clay loam. The lower part is yellowish brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some places the surface layer is darker. In other places the subsoil contains less clay. In a few areas the seasonal high water table is at a depth of more than 6 feet. In a few places loam or clay loam glacial till is at a depth of more than 40 inches. In some areas the surface soil is thicker.

Water and air move through this soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings with basements, the seasonal high water table and the shrink-swell potential are limitations. The shrink-swell potential also is a limitation on sites for dwellings without basements. Installing subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action

are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

280B—Fayette silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable silty clay loam. The next part is yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silt loam. In some places the surface layer is darker. In other places the subsoil contains less clay. In some areas a seasonal high water table is at a depth of 4 to 6 feet. In a few areas the surface layer is thinner.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

Adapted pasture and hay plants grow well on this soil. Overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the hazard of erosion. Proper stocking rates, rotation grazing, 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 woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

280C2—Fayette silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. It contains fragments of yellowish brown silty clay loam from the subsoil. The subsoil is about 37 inches thick. The upper part is yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silt loam. The substratum to a depth of 60 inches or more also is yellowish brown, friable silt loam. In some places the surface layer is darker. In other places the subsoil contains less clay. In a few areas a seasonal high water table is at a depth of 4 to 6 feet. In a few places loam or clay loam glacial till is below a depth of 40 inches. In some areas the surface soil is thicker.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed.

The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

354B—Hononegah loamy sand, 1 to 4 percent slopes. This gently sloping, excessively drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface soil is very dark grayish brown, very friable loamy sand about 19 inches thick. The subsoil is about 9 inches thick. The upper part is dark brown, very friable loamy sand. The lower part is brown, very friable gravelly loamy sand. The substratum extends to a depth of 60 inches or more. The upper part is dark yellowish brown, loose gravelly sand. The next part is yellowish brown, loose, calcareous very gravelly sand. The lower part is brown, loose, calcareous very gravelly sand. In some areas the surface layer and the subsoil contain more clay. In other areas the substratum is sand throughout and does not have gravel. In a few places the slope is as much as 10 percent. In a few areas limestone bedrock is within a depth of 60 inches.

Water and air move through this soil at a very rapid rate. Surface runoff is slow. Available water capacity is very low. The content of organic matter is low.

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

If this soil is used for corn, soybeans, or small grain, wind erosion is a hazard and droughtiness is a limitation. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. Irrigation can supply additional moisture. The low content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay and pasture, wind erosion is a hazard and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover. Irrigation can supply additional moisture.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is IVs.

386B—Downs silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges in the uplands. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silt loam; yellowish brown, mottled, friable silty clay loam; and yellowish brown, mottled, friable silt loam. In some places the dark surface soil is more than 10 inches thick. In other places the surface layer is lighter in color. In a few places the seasonal high water table is within a depth of 4 feet. In some areas the subsoil contains less clay. In other areas the surface layer is thinner. In places the seasonal high water table is at a depth of more than 6 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is very high. The content of organic matter is moderate. The shrink-swell potential also is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion.

Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings with basements, the seasonal high water table and the shrink-swell potential are limitations. The shrink-swell potential also is a limitation on sites for dwellings without basements. Installing subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

386C2—Downs silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on side slopes along drainageways in the uplands. Individual areas are irregularly shaped or elongated and range from 5 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is about 38 inches thick. In sequence downward, it is yellowish brown, friable silt loam; yellowish brown, friable silty clay loam; yellowish brown, mottled, friable silty clay loam; yellowish brown, mottled, friable silt loam; and brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is brown, mottled, friable silt loam. In some places the surface layer is lighter colored. In other places the dark surface soil is thicker. In some areas the subsoil has less clay. In a few areas the seasonal high water table is at a depth of more than 6 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderate. The shrink-swell potential also is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops (fig. 8), a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings with basements, the seasonal high water table and the shrink-swell potential are limitations. The shrink-swell potential also is a limitation on sites for dwellings without basements. Installing subsurface tile drains near the foundations helps to overcome the wetness. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

410D2—Woodbine silt loam, 7 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. It contains fragments of dark yellowish brown silt loam from the subsoil. The subsoil is about 39 inches thick. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silt loam; brown and yellowish brown, friable clay loam; and yellowish red, firm silty clay. Hard, fractured limestone bedrock is at a depth of about 46 inches. In some places the surface layer is darker. In other places the surface soil is thicker. In some areas the content of chert fragments ranges from 10 to 20 percent in the surface layer and the upper part of the subsoil. In other areas the surface layer and the upper part of the subsoil contain more sand. In a few places the lower

Figure 8.—Alfalfa hay in an area of Downs silt loam, 5 to 10 percent slopes, eroded, provides a good vegetative cover and thus helps to control erosion.

part of the subsoil contains thin subhorizons of sand or loamy sand. In a few areas the middle parts of the subsoil are silt loam throughout. In some areas hard, fractured limestone bedrock is within a depth of 40 inches. In a few areas the slope is less than 7 percent.

Included with this soil in mapping are small areas of Pecatonica and Ross soils. These soils are more than 60 inches deep over limestone bedrock. Pecatonica soils are in the higher positions on the side slopes. Ross soils are in narrow drainageways that are subject to flooding. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Woodbine soil at a moderate rate and through the lower part at a slow rate. Surface runoff is rapid. Available water capacity is moderate. The content of organic matter is moderately low. Root growth is restricted by the limestone bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate in the upper part of the subsoil and high in the lower part. The potential for frost action is moderate.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes mainly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, controlling fire and eliminating grazing are essential. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. On sites for dwellings with basements, the depth to bedrock also is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and land shaping help to overcome the slope. Basements can be built above the level of the bedrock.

If this soil is used as a site for septic tank absorption fields, the slow permeability is a limitation. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, the slope, the shrink-swell potential, and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage. Grading may be needed in some areas.

The land capability classification is IIIe.

411B—Ashdale silt loam, 2 to 7 percent slopes. This gently sloping, well drained soil is on uplands. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 4 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is brown, friable silt loam; dark yellowish brown, friable silt loam; strong brown, firm clay loam; and yellowish red, firm clay. Hard, fractured limestone bedrock is at a depth of about 57 inches. In some areas the dark surface soil is thinner. In other areas the surface soil and the upper part of the subsoil contain more sand. In a few places hard, fractured limestone bedrock is within a depth of 40 inches. In a few areas the lower part of the subsoil contains thin subhorizons of sand or loamy sand.

Included with this soil in mapping are small areas of Ogle soils. These soils are more than 60 inches deep over limestone bedrock. They are in landscape positions similar to those of the Ashdale soil. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Ashdale soil at a moderate rate and through the lower part at a slow rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. Root growth is restricted by the limestone bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate in the upper part of the subsoil and high in the lower part. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. The depth to bedrock also is a limitation on sites for dwellings with basements. Reinforcing footings and foundations helps to minimize the structural damage caused by shrinking and swelling. Basements can be built above the level of the bedrock.

If this soil is used as a site for septic tank absorption fields, the slow permeability is a limitation. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

412B—Ogle silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on uplands. Individual areas are irregular in shape and range from 25 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark brown, friable silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, friable silt loam; yellowish brown, friable silt loam; yellowish red, firm clay loam; and reddish brown, firm clay loam. In some areas the dark surface layer is thinner. In other areas the subsoil contains thin subhorizons of sand or loamy sand. In a few places the loamy material is within a depth of 30 inches.

Included with this soil in mapping are small areas of Ashdale soils. These soils have limestone bedrock within a depth of 60 inches. They are in landscape positions similar to those of the Ogle soil. They make up 5 to 10 percent of the unit.

Water and air move through the Ogle soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

412C—Ogle silt loam, 5 to 10 percent slopes. This moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, friable silt loam; dark yellowish brown, friable silt loam; strong brown, friable clay loam; and yellowish red and strong brown, friable clay loam. In some areas the dark surface layer is thinner. In other areas the subsoil contains thin subhorizons of sand or loamy sand. In a few places the loamy material is within a depth of 30 inches. In a few areas the surface soil is lighter colored.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

430A—Raddle silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on foot slopes and stream terraces. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is black, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 11 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, the next part is dark yellowish brown, and the lower part is yellowish brown and is mottled. In some areas the dark surface soil is more than 24 inches thick. In other areas a seasonal high water table is at a depth of 4 to 6 feet. In some places the soil has a layer of light-colored silt loam overwash. In other places the subsoil contains thin strata of reddish brown clay loam, silty clay, or clay. In some areas the soil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Littleton soils in the slightly lower positions. Also included are a few small areas in the slightly lower positions near stream channels that are subject to occasional flooding. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Raddle soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderately high. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. A system of conservation tillage that leaves crop residue on the surface after planting helps to prevent crusting and maintain tilth. Conservation practices are commonly needed in areas upslope from this soil to control runoff and siltation.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

430B—Raddle silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on foot slopes and stream terraces. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 16 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, the next part is dark yellowish brown and yellowish brown, and the lower part is yellowish brown and is mottled. In some areas the dark surface soil is more than 24 inches thick. In other areas a seasonal high water table is between depths of 4 and 6 feet. In some places the soil has a layer of light-colored silt loam overwash. In other places the soil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Littleton soils in the slightly lower positions. Also included are areas in the slightly lower positions near stream channels that are subject to rare flooding. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Raddle soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The content of organic matter is moderately high. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth. Conservation practices are commonly needed in areas upslope from this soil to control runoff and siltation.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

447—Canisteo loam, sandy substratum. This nearly level, poorly drained soil is on outwash plains. Individual areas are irregular in shape and range from 5 to 800 acres in size.

Typically, the surface layer is black, friable, calcareous loam about 9 inches thick. The subsurface layer is about 14 inches thick. The upper part is black, friable, calcareous loam. The lower part is very dark gray, friable, calcareous clay loam. The subsoil is about

26 inches thick. The upper part is dark gray, friable, calcareous clay loam. The next part is grayish brown, mottled, friable, calcareous clay loam. The lower part is grayish brown, mottled, very friable sandy loam. The substratum to a depth of 60 inches or more is light brownish gray, loose sand. In some areas sand or loamy sand is within a depth of 40 inches. In a few places the dark surface layer is less than 10 inches thick. In some areas the dark surface soil is more than 24 inches thick. In other areas the substratum contains gravel. In a few places the surface soil and the subsoil contain more sand.

Included with this soil in mapping are a few areas along drainage ditches that are subject to occasional flooding. These areas make up 5 to 10 percent of the unit.

Water and air move through the subsoil of the Canisteo soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is very slow. The water table is at the surface to 1 foot below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the seasonal high water table.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. The high lime content of this soil affects the availability of many plant nutrients and influences the effectiveness of herbicides. More frequent applications of fertilizer are needed to correct nutrient imbalances. The applications of herbicides should be adjusted as the level of alkalinity increases. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the seasonal high water table and low strength are limitations. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

485B—Richwood silt loam, 2 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 20 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 12 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is strong brown, mottled, friable, stratified fine sandy loam and loamy sand. In some areas the dark surface layer is thinner. In other areas the loamy material is within a depth of 40 inches. In places the subsoil is silt loam throughout. In a few areas the seasonal high water table is at a depth of 4 to 6 feet. A few areas are nearly level. In a few places the lower part of the subsoil is loamy glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and poorly drained Drummer soils. Drummer soils are in shallow depressions and drainageways that are subject to ponding. Elburn soils are slightly lower on the landscape than the Richwood soil. Included soils make up 10 to 15 percent of the map unit.

Water and air move through the upper part of the Richwood soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops (fig. 9). This soil is well suited to cultivated crops, hay, and pasture and to septic tank absorption fields. It is moderately suited to dwellings. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing

Figure 9.—Corn in an area of Richwood silt loam, 2 to 5 percent slopes.

the base material helps to prevent damage.
The land capability classification is IIe.

485C2—Richwood silt loam, 5 to 10 percent slopes, eroded. This moderately 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 very dark grayish brown, friable silt loam about 9 inches thick. It contains fragments of dark yellowish brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silt loam; yellowish brown, friable, stratified silt loam, loam, and sandy loam; and stratified, very friable, yellowish brown loamy sand and sand and brown sandy loam. In places the surface layer is lighter colored. In some areas the subsoil is silt loam throughout. In a few areas the loamy material is within a depth of 40 inches. In a few places a seasonal high water table is between depths of 4 and 6 feet. In a few areas the lower part of the subsoil is loamy glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn soils. These soils are in nearly level areas in drainageways. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Richwood soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

486B—Bertrand silt loam, 2 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 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silt loam that has thin strata of loam and sandy loam. In some places the loamy material is within a depth of 40 inches. In other places the subsoil is silt loam throughout. In some areas a seasonal high water table is at a depth of 4 to 6 feet. In other areas the surface layer is darker. A few areas are nearly level. In a few places the lower part of the subsoil is loamy glacial till.

Water and air move through the upper part of this soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

486C2—Bertrand silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is 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 brown, friable silt loam about 8 inches thick. It contains fragments of dark yellowish brown silt loam from the subsoil. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark yellowish brown, friable silt loam; yellowish brown, friable silt loam; yellowish brown, friable, stratified fine sandy loam and loam; and stratified, very friable, light yellowish brown loamy fine sand and brown fine sandy loam. In some places the surface layer is darker. In other places the subsoil is silt loam throughout. In a few areas the loamy material is within a depth of 40 inches. In a few places a seasonal high water table is between depths of 4 and 6 feet. In a few areas the lower part of the subsoil is loamy glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Orion soils. These soils are in narrow drainageways that are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Bertrand soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, or a combination of these practices can help to keep soil loss within tolerable limits. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity and tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus helps to prevent surface compaction, excessive runoff, and further erosion. When a seedbed is prepared or the pasture is renovated, tilling on the contour helps to control erosion. Using a no-till system of seeding also helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

509B—Whalan loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on high limestone benches. Individual areas are irregularly shaped or long and narrow and range from 5 to 75 acres in size.

Typically, the surface layer is dark brown, very friable loam about 5 inches thick. The subsurface layer is brown, very friable loam about 6 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, friable loam. The next part is yellowish brown, friable clay loam. The lower part is brown and yellowish brown, friable clay loam. Hard, fractured limestone bedrock is at a depth of about 29 inches. In places the surface soil and the subsoil contain more sand. In some areas the surface soil is darker and thicker. In other areas hard, fractured limestone bedrock is below a depth of 40 inches. In a few places the slope ranges from 5 to 10 percent.

Included with this soil in mapping are small areas of the poorly drained Faxon soils. These soils are in the lower lying positions and are subject to flooding. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Whalan soil at a moderate rate and through the lower part at a slow rate. Surface runoff is medium. Available water capacity is low. The content of organic matter also is low. Root growth is restricted by the limestone bedrock at a depth of 20 to 40 inches. The shrink-swell potential is high. The potential for frost action is moderate.

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

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and droughtiness is a limitation. Contour farming and a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion, conserve moisture, and help to maintain tilth.

Adapted pasture and hay plants grow well on this soil. Overgrazing reduces forage yields, causes surface compaction and excessive runoff, and increases the hazard of erosion. Proper stocking rates, rotation grazing, 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 woodland, controlling fire and eliminating grazing are essential. Harvesting methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed. Competing vegetation can be controlled by chemical or mechanical methods or both.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

533—Urban land. This map unit consists of nearly level to gently sloping areas covered by parking lots, streets, buildings, and other structures. Most areas are in the larger cities and towns. Individual areas range from 10 to 100 acres in size. Slopes range from 0 to 5 percent.

Most urban land consists of shopping centers, industrial plants, and other commercial areas and the associated streets and parking lots. These areas make up more than 85 percent of the map unit. In most remaining open areas, cutting and filling have so altered the soil material that identification of the soil series is not possible.

Included in mapping are small areas of Orthents. These areas have been cut and filled with loamy soil material. They make up 5 to 10 percent of the unit.

Runoff is very rapid in the areas of urban land. Most paved areas are designed to divert runoff into storm drainage systems. If it is not controlled, runoff can increase the hazard of erosion in adjacent areas. It also increases the hazard of flooding.

The vegetation in areas of this map unit consists mainly of grassed borders, trees, weeds, and shrubs. Planting grasses in border areas helps to control runoff and erosion.

Sod may be needed in areas where plants are difficult to establish. Mulching, applying fertilizer, spraying to control weeds and pests, and watering during dry periods encourage good plant growth.

No land capability classification is assigned.

562B—Port Byron silt loam, sandy substratum, 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 100 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil to a depth of 60 inches or more is friable silt loam. The upper part is brown, and the lower part is yellowish brown and dark yellowish brown. In some places the surface layer is thinner. In other places the dark surface soil is more than 24 inches thick. In some areas the lower part of the subsoil and the substratum are silt loam. In other areas the soil contains more sand within a depth of 40 inches. A few areas are nearly level.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower, nearly level areas. They make up 5 to 10 percent of the unit.

Water and air move through the surface layer and the subsoil of the Port Byron soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is well suited to dwellings and septic tank absorption fields. Because of the rapid permeability in the substratum, ground-water contamination is a hazard. The soil is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Returning crop residue to the soil and adding other organic material improve tilth.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

564A—Waukegan silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 13 inches thick. The subsoil is about 22 inches thick. The upper part is brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable sandy loam. The substratum extends to a depth of 60 inches or more. The upper part is strong brown, loose loamy sand. The lower part is yellowish brown, loose sand. In places the surface soil and the subsoil contain more sand. In some areas the dark surface soil is more than 24 inches thick. In a few areas, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches. In a few places a seasonal high water table is at a depth of 4 to 6 feet. In a few areas the dark surface layer is thinner.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower areas. They make up 2 to 5 percent of the unit.

Water and air move through the surface soil and the subsoil of the Waukegan soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. Available water capacity is moderate. The content of organic matter is moderately high.

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

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting conserves moisture and helps to maintain tilth.

In areas used for pasture, including grasses and legumes in the cropping sequence helps to maintain tilth. Selecting suitable species for planting, using proper stocking rates, and applying fertilizer help to keep the pasture in good condition.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIs.

564B—Waukegan silt loam, 2 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 60 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark brown, friable silt loam about 4 inches thick. The subsoil is about 22 inches thick. The upper part is brown, dark yellowish brown, and yellowish brown, friable silt loam. The lower part is yellowish brown, friable sandy loam. The substratum extends to a depth of 60 inches or more. The upper part is yellowish brown, loose loamy sand. The lower part is yellowish brown, loose sand. In places the dark surface layer is thinner. In some areas, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches. In other areas the surface soil and the subsoil contain more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower, nearly level areas. They make up 2 to 5 percent of the unit.

Water and air move through the surface soil and the subsoil of the Waukegan soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is medium. Available water capacity is moderate. The content of organic matter is moderately high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is well suited to dwellings. It 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 and droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting, a crop rotation that includes forage crops, and contour farming help to control erosion, conserve moisture, and help to maintain tilth.

In areas used for pasture, a cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

564C2—Waukegan silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil is about 25 inches thick. In sequence downward, it is brown, friable silt loam; dark yellowish brown, friable silt loam; yellowish brown, friable silt loam; and yellowish brown, friable loam. The substratum to a depth of 60 inches or more is strong brown, very friable sand that has lenses of loamy sand. In some places the dark surface soil is thicker. In other places the surface layer is lighter colored. In some areas the surface layer and the subsoil contain more sand. In a few areas, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches.

Water and air move through the surface layer and the subsoil at a moderate rate and through the substratum at a rapid rate. Surface runoff is medium. Available water capacity is moderate. The content of organic matter is moderately high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is well suited to dwellings. It 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 and droughtiness is a limitation. A crop rotation that includes forage crops and a combination of contour farming and a system of conservation tillage that leaves crop residue on the surface after planting conserve moisture and help to control erosion and maintain tilth.

In areas used for pasture, a cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

565B—Tell silt loam, 2 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 40 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, friable loam. The lower part is strong brown and dark yellowish brown, very friable loamy sand. The substratum to a depth of 60 inches or more is strong brown and dark brown, very friable loamy sand. In some places the surface soil is darker. In a few areas, the lower part of the subsoil is thicker and contains more clay and the underlying loamy sand is below a depth of 40 inches. In places the surface soil and the subsoil contain more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower, nearly level areas. They make up 2 to 5 percent of the unit.

Water and air move through the upper part of this soil at a moderate rate and through the lower part of the subsoil and the substratum at a rapid rate. Surface runoff is medium. Available water capacity is moderate. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, woodland, hay, and pasture and to dwellings without basements. It is well suited to dwellings with basements. It 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 and droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting, a crop rotation that includes forage crops, and contour farming conserve moisture and help to control erosion and maintain tilth.

In areas used for pasture, a cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing the foundations or extending the footings below the subsoil helps to overcome this limitation.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIe.

565C2—Tell silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregularly shaped or long and narrow and range from 3 to 40 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 6 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is about 28 inches thick. The upper part is yellowish brown, friable silt loam. The next part is brown, friable silt loam. The lower part is strong brown, friable loam. The substratum to a depth of 60 inches or more is strong brown, very friable loamy sand that has lenses of sand. In some areas the surface layer is darker. In other areas the surface soil is thicker. In a few areas the surface layer and the subsoil contain more sand. In some places, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches.

Water and air move through the surface layer and the subsoil at a moderate rate and through the substratum at a rapid rate. Surface runoff is medium. Available water capacity is moderate. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, woodland, hay, and pasture and to dwellings without basements. It is well suited to dwellings with basements. It 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 and droughtiness is a limitation. A crop rotation that includes forage crops and a combination of contour farming and a system of conservation tillage that leaves crop residue on the surface after planting conserve moisture and help to control erosion and maintain tilth.

In areas used for pasture, a cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing the foundations or extending the footings below the subsoil helps to overcome this limitation.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIIe.

565D2—Tell silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregularly shaped or long and narrow and range from 2 to 40 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is about 19 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, very friable sandy loam. The substratum extends to a depth of 60 inches or more. The upper part is yellowish brown, very friable loamy sand. The lower part is strong brown, very friable loamy sand that has lenses of brownish yellow sand. In some areas the surface layer is darker. In other areas the surface layer is thicker. In a few areas the surface layer and the subsoil contain more sand. In some places, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches. In a few places on north- and east-facing slopes, the slope is greater than 15 percent.

Water and air move through the surface layer and the subsoil at a moderate rate and through the substratum at a rapid rate. Surface runoff is rapid. Available water capacity is moderate. The content of organic matter is moderately low. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and droughtiness is a limitation. A crop rotation that includes mainly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity and conserve moisture.

In areas used for pasture, a cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the slope is a limitation. On sites for dwellings without basements, the shrink-swell potential also is a limitation. Cutting, filling, and land shaping help to overcome the slope. Reinforcing the foundations or extending the footings below the subsoil helps to prevent the damage caused by shrinking and swelling.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IVe.

575—Joy silt loam, sandy substratum. This nearly level, somewhat poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 12 inches thick. The subsoil is about 27 inches thick. The upper part is dark brown, mottled, friable silt loam. The next part is brown and light brownish gray, mottled, friable silt loam. The lower part is brown, mottled, friable loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, very friable loamy sand. In some areas the surface soil is more than 24 inches thick. In other areas loamy sand is within a depth of 40 inches. In some places the lower part of the subsoil and the substratum are silt loam. In a few areas the subsurface layer is lighter colored.

Included with this soil in mapping are small areas of the well drained Port Byron soils that have a sandy substratum. These soils are in the slightly higher, gently sloping areas. Also included are small areas of the poorly drained Drummer soils in low areas that are subject to ponding. Included soils make up 10 to 15 percent of the unit.

Water and air move through the surface layer and the subsoil of the Joy soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. Available water capacity is high. The content of organic matter is moderately high. The water table is at a depth of 2 to 4 feet during the spring. The potential for frost action is high.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface drains around the foundations lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Elevating the absorption field with suitable fill material and using curtain drains reduce wetness and the hazard of ground-water contamination caused by the rapid permeability in the substratum.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

638—Muskego muck. This nearly level, very poorly drained soil is in depressions on outwash plains. It is subject to ponding for brief periods from November through May. Individual areas are irregularly shaped or elongated and range from 10 to 80 acres in size.

Typically, the surface layer is black, friable muck about 10 inches thick. The subsurface layer is about 14 inches thick. The upper part is black, mottled, friable muck. The lower part is very dark grayish brown, mottled, friable, calcareous muck. The substratum to a depth of 60 inches or more is mottled, friable, calcareous sedimentary peat. The upper part is dark brown and light gray, and the lower part is very dark grayish brown. In some places the substratum is loam or silt loam. In a few areas the soil is muck to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the mineral Gilford and Marshan soils. These soils are in landscape positions similar to those of the Muskego soil. They make up 10 to 15 percent of the unit.

Water and air move through the organic layers of the Muskego soil at a moderately rapid rate and through the underlying sedimentary peat at a slow rate. Surface runoff is very slow or ponded. The water table is 1 foot above to 1 foot below the surface during the spring. Available water capacity is very high. The content of organic matter also is very high. The shrink-swell potential is moderate in the sedimentary peat. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and subsidence. It is generally unsuited to local roads and streets because of the potential for frost action, the ponding, and subsidence.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function well, however, because of subsidence and the slow permeability in the underlying sedimentary peat. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

The land capability classification is IVw.

647—Lawler loam. This nearly level, somewhat poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 21 inches thick. The upper part is brown, mottled, friable silt loam. The lower part is grayish brown, mottled, friable loam. The substratum to a depth of 60 inches or more is brown and dark grayish brown, mottled, loose coarse sand. In some places the surface soil is more than 24 inches thick. In other places, the subsoil is thicker and coarse sand is below a depth of 40 inches. In some areas the substratum is mildly alkaline and calcareous. In a few places, the dark surface layer is thinner and the subsurface layer is lighter colored. In a few areas a seasonal high water table is at a depth of 4 to 6 feet. In a few other areas the subsoil contains more sand.

Included with this soil in mapping are small areas of the somewhat excessively drained and well drained Dickinson soils and the very poorly drained Marshan soils. Dickinson soils are in the higher positions. Marshan soils are in low areas that are subject to ponding. Included soils make up 10 to 15 percent of the unit.

Water and air move through the surface layer and the subsoil of the Lawler soil at a moderate rate and through the substratum at a very rapid rate. Surface runoff is slow. The water table is at a depth of 2 to 4 feet during the spring. Available water capacity is moderate. The content of organic matter is high. The potential for frost action also is high.

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

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation in midsummer. A system of conservation tillage that leaves crop residue on the surface after planting minimizes crusting, helps to maintain tilth, and conserves moisture. Irrigation can supply additional moisture. Subsurface drainage may be needed to allow for timely tillage in the spring. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface drains around the foundations lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation. If suitable outlets are available, installing underground drains enclosed by filter or envelope material lowers the water table. Diverting surface water from the filter bed helps to keep the system functioning properly. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IIs.

727—Waukee loam. This nearly level, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 6 inches thick. The subsoil is about 29 inches thick. In sequence downward, it is brown, friable loam; dark yellowish brown, friable loam; dark yellowish brown, friable sandy clay loam; and brown and strong brown, very friable loamy coarse sand. The substratum extends to a depth of 60 inches or more. The upper part is brown and strong brown, loose coarse sand. The lower part is yellowish brown, loose sand. In some places the surface soil and the subsoil contain more sand. In some areas the lower part of the subsoil and the substratum do not have gravel throughout. In a few areas the lower part of the subsoil is thicker and contains more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawler soils in the slightly lower positions. These soils make up 5 to 10 percent of the unit.

Water and air move through the surface soil and the subsoil of the Waukee soil at a moderate rate and through the substratum at a very rapid rate. Surface runoff is slow. Available water capacity is moderate. The content of organic matter is moderately high.

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

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation. A system of conservation tillage that leaves crop residue on the surface after planting conserves moisture and helps to maintain tilth. Irrigation can supply additional moisture.

In areas used for pasture, including grasses and legumes in the cropping sequence helps to maintain tilth. Selection of suitable species for planting, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

The land capability classification is IIs.

763—Joslin silt loam. This nearly level, well drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 15 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and yellowish brown, friable silt loam. The next part is yellowish brown and brown, friable silty clay loam. The lower part is yellowish brown, mottled, friable silty clay loam. In some areas the dark surface soil is less than 10 inches thick. In other areas the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Denrock soils. These soils are in the slightly lower positions and contain more clay in the upper part of the subsoil than the Joslin soil. Also included are a few small areas in the slightly lower positions near stream channels that are subject to occasional flooding. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Joslin soil at a moderately slow rate. Surface runoff is slow. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential and the potential for frost action are moderate.

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

No major limitations affect the use of this soil for corn, soybeans, or small grain. A system of conservation tillage that leaves crop residue on the surface after planting minimizes crusting and helps to maintain tilth.

The moderately slow permeability is a limitation if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome this limitation.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

767—Prophetstown silt loam. This nearly level, poorly drained soil is in low areas on outwash plains and on till plains in the uplands. It is subject to ponding for brief periods from March through May. Individual areas are irregular in shape and range from 5 to 1,000 acres in size.

Typically, the surface layer is black, friable, calcareous silt loam about 9 inches thick. The subsurface layer is very dark gray, mottled, friable, calcareous silt loam about 7 inches thick. The subsoil is mottled, friable, calcareous silt loam about 24 inches thick. The upper part is dark grayish brown, and the lower part is light brownish gray. The substratum to a depth of 60 inches or more is mottled, friable, and calcareous. The upper part is light brownish gray silt loam. The lower part is light gray, stratified loam, sandy loam, and silt loam. In some places the dark surface soil is less than 10 inches thick. In other places the surface soil and the subsoil contain more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are not calcareous. They are in landscape positions similar to those of the Prophetstown soil. They make up 5 to 10 percent of the unit.

Water and air move through the Prophetstown soil at a moderate rate. Surface runoff is very slow or ponded. Available water capacity is very high. The content of organic matter is high. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields and to dwellings because of the ponding.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches can remove excess water where suitable outlets are available. The high lime content of this soil affects the availability of many plant nutrients and influences the effectiveness of herbicides. More frequent applications of fertilizer are needed to correct nutrient imbalances. The applications of herbicides should be adjusted as the level of alkalinity increases. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

Low strength, the potential for frost action, and the ponding are management concerns on sites for local roads and streets. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

770—Udolpho loam. This nearly level, poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 8 inches thick. The subsurface layer is grayish brown, mottled, friable loam about 5 inches thick. The subsoil is about 17 inches thick. The upper part is dark grayish brown, mottled, friable clay loam. The lower part is grayish brown, mottled, friable sandy clay loam. The substratum to a depth of 60 inches or more is grayish brown, loose coarse sand and sand. In some areas the dark surface layer is thicker. In other areas the surface layer is lighter in color. In some places the subsoil contains less clay. In a few areas sandy loam, silt loam, or loam is below a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat excessively drained and well drained Dickinson soils. These soils are more droughty than the Udolpho soil. They are in the higher positions. They make up 5 to 10 percent of the unit.

Water and air move through the surface layer and the subsoil of the Udolpho soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is moderate. The content of organic matter also is moderate. The potential for frost action is high.

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

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting. Droughtiness is a limitation in midsummer. Irrigation can supply additional moisture.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface drains around foundations lowers the water table. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation. If suitable outlets are available, installing underground drains enclosed by filter or envelope material lowers the water table. Diverting surface water from the filter bed helps to keep the system functioning properly. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IIw.

772—Marshan loam. This nearly level, very poorly drained soil is in low areas on outwash plains. It is subject to ponding for brief periods from March through May. Individual areas are irregular in shape and range from 10 to 600 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is black, friable clay loam about 14 inches thick. The subsoil is gray and dark gray, mottled, friable loam about 11 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is grayish brown, loose coarse sand. The lower part is pale brown, loose, calcareous sand. In some areas the dark surface soil is less than 10 inches thick. In a few areas, the subsoil is thicker and the underlying coarse sand and sand are below a depth of 40 inches. In some places the soil contains less clay. In other places the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawler soils. These soils are in the slightly higher positions that are not subject to ponding. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Marshan soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is very slow or ponded. The water table is 2 feet above to 1 foot below the surface during the spring. Available water capacity is moderate. The content of organic matter is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings because of the ponding. It is generally unsuited to septic tank absorption fields because of the ponding and a poor filtering capacity.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the ponding and the potential for frost action are management concerns. Open ditches can be used to remove excess water. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IIIw.

777—Adrian muck. This nearly level, very poorly drained soil is in depressions on outwash plains. It is subject to ponding for brief periods from November through May. Individual areas are irregularly shaped or elongated and range from 5 to 10 acres in size.

Typically, the surface soil is black, friable muck about 2 inches thick. The substratum to a depth of 60 inches or more is pale brown and brown, mottled, loose sand. In some places the substratum contains more clay. In other places the soil is muck to a depth of 60 inches or more. In a few areas the muck is underlain by sedimentary peat. In some areas the substratum is coarse sand.

Included with this soil in mapping are small areas of the mineral Gilford and Marshan soils. These soils are in landscape positions similar to those of the Adrian soil. They make up 10 to 15 percent of the unit.

Water and air move through the organic layers of the Adrian soil at a moderately slow to moderately rapid rate and through the underlying sand at a rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is high. The content of organic matter is very high. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to dwellings because of the ponding, subsidence, and low strength and to septic tank absorption fields because of the ponding, a poor filtering capacity, and subsidence. It is generally unsuited to local roads and streets because of the ponding, low strength, and subsidence.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function 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.

The land capability classification is IVw.

785G—Lacrescent cobbly loam, 25 to 60 percent slopes. This steep, well drained soil is on side slopes in the uplands. Individual areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, very friable, calcareous cobbly loam about 5 inches thick. The subsurface layer is dark brown, very friable, calcareous cobbly loam about 7 inches thick. The subsoil is brown, very friable, calcareous very cobbly loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, very friable, calcareous very cobbly loam. In a few areas the slope is less than 25 percent. In a few places the surface layer is channery loam.

Included with this soil in mapping are small areas of Lamont, Seaton, and Timula soils. These soils do not have cobbly fragments and are more than 60 inches deep over limestone bedrock. They are higher on the side slopes than the Lacrescent soil. Lamont soils formed in loamy and sandy sediments. Seaton and Timula soils formed entirely in loess. Also included are some areas where limestone bedrock occurs as outcrops on the surface or is exposed vertically as ledges (fig. 10). Included areas make up 10 to 15 percent of the unit.

Water and air move through the surface layer of the Lacrescent soil at a moderate rate and through the subsoil and substratum at a moderately rapid rate. Surface runoff is very rapid. Available water capacity is low. The content of organic matter is moderately high. The potential for frost action is moderate.

Most areas are used as woodland. A few areas are used as pasture. This soil is suited to habitat for woodland wildlife. It is poorly suited to pasture. It is generally unsuited to cultivated crops, to hay, to septic tank absorption fields, to dwellings, and to local roads and streets because of the slope, large stones, and the rock outcrops.

If this soil is used as pasture, erosion is a hazard and droughtiness is a limitation. Pasture renovation is difficult because of the slope, the large stones, and the rock outcrops. Proper stocking rates, pasture rotation, delayed grazing, and restricted use during wet and very dry periods increase forage production and help to control erosion and compaction.

The existing stands of trees provide good habitat for woodland wildlife. Controlling fire and eliminating grazing of the woodland help to prevent the depletion of shrubs and sprouts, which provide food for wildlife.

The land capability classification is VIIe.

802B—Orthents, loamy, undulating. These nearly level and gently sloping, moderately well drained soils are typically on stream terraces and uplands. They formed in material that has been altered by extensive cutting and filling. Individual areas are irregularly shaped or rectangular and range from 5 to 200 acres in size. Slopes range from 0 to 5 percent.

Typically, the mixed soil material is silt loam, loam, and gravelly loam. The soil material commonly is more than 5 feet thick. In many areas nonsoil material, such as broken bricks, glass, and concrete, is incorporated into the soils. In some areas the water table is below a depth of 6 feet during the spring. In a few areas the slope is greater than 5 percent.

Included in mapping are small areas, in factory parking lots and storage depots, that are covered with crushed rock or railroad cinders and that support little or no vegetation. These areas make up 5 to 10 percent of the unit.

Water and air move through the Orthents at varying rates, depending on the degree of compaction caused by construction equipment. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The organic matter content is low.

Most areas are used for industrial development or are idle land. Onsite investigation is needed to determine the limitations or hazards affecting construction. Adding fertilizer and mulching help in the establishment of landscaping plants.

No land capability classification is assigned.

865—Pits, gravel. This map unit consists of excavations from which gravel and sand have been removed and of disturbed areas around the excavations. The pits are in outwash areas and on stream terraces. They are 5 to 50 acres in size.

The soil material in the pits is sandy and gravelly. The excavations are 10 to 80 feet deep. They support little or no vegetation. Pits that have been filled with water are identified as water areas on the soil maps.

Included in mapping are small areas of Orthents,

Figure 10.—A vertical exposure of limestone in an area of Lacrescent cobbly loam, 25 to 60 percent slopes.

which support vegetation. These soils are in areas where mine spoil has been mixed with soil material from around the pits. They make up less than 15 percent of the map unit.

Most areas of this unit are used for mining. Some areas adjoining water-filled pits are used for recreation. The unit is moderately suited to recreational uses. Stocking the water-filled pits with fish and planting trees enhance the recreational areas. Topdressing and grading the disturbed areas help to establish vegetation.

No land capability classification is assigned.

868—Pits, organic. This map unit consists of excavations from which topsoil has been removed for commercial packaging and distribution. The pits are in the Cattail Channel bottom land. The areas are very poorly drained and are subject to rare flooding. They also are subject to ponding from November through May. Individual areas range from 20 to 200 acres in size.

The soil material is primarily mixed layers of muck that has been disturbed by topsoil mining. Most areas contain rows beside which the topsoil is mined, laid out for drying, and then removed for processing and packaging during the field season. The continual movement of materials in these areas does not permit the growth of vegetation. The excavations are 10 to 20 feet deep. Pumps are used to drain excess water from the pits. The excess water is caused by the seasonal high water table. During the seasons when no mining takes place, the water table is ponded in many areas.

Included in mapping are small, narrow ditchbanks consisting of disturbed mucky and silty soil material along drainageways. These areas support vegetation. Also included are a few areas where the topsoil has been stockpiled for storage next to processing facilities. Included areas make up 2 to 5 percent of the unit.

Most areas of this unit are used for mining activities. The areas are suited to water-based recreational uses in areas where mining activities have ceased and water fills the pits. Stocking the water-filled pits with fish and planting adapted species of grasses along borders enhance the recreational areas.

No land capability classification is assigned.

869—Pits, quarries-Orthents complex. This map unit consists of quarry pits, which are nearly level and gently sloping basins having nearly vertical sidewalls, and of Orthents, which are steeply sloping areas of overburden surrounding the pits. Individual areas of this map unit are irregularly shaped or rectangular and range from 5 to 60 acres in size. They are about 70 to 75 percent Pits, quarries, and 20 to 25 percent Orthents.

The quarry basins and sidewalls are mainly exposed limestone bedrock. Strips of soil material are generally along the tops of the sidewalls, and a talus slope is along the basin in places. Typically, the Orthents are mixed overburden material that is cobbly loam and flaggy loam. The soil material is more than 5 feet thick.

Included in mapping are roads used in hauling the quarried materials, stockpiles of crushed limestone, and some areas covered with machinery and debris. Included areas make up 5 to 10 percent of the unit.

Most quarries are actively mined for limestone. They are poorly suited to most other uses. Some areas are suitable for paths and trails. Some depressional areas are suitable for use as pond reservoir areas. Falling rock is a hazard.

Most areas of the Orthents have been reseeded to a vegetative cover of grasses and legumes. Some areas are left idle. The Orthents are generally unsuited to most uses because of the slope and stoniness. Some areas are suitable for upland wildlife habitat. Adding fertilizer and selecting adapted species of grasses and legumes help to establish the plants.

No land capability classification is assigned.

917C2—Oakville-Tell complex, 4 to 10 percent slopes, eroded. These moderately sloping, well drained soils are on outwash plains. Individual areas are irregular in shape and range from 10 to 200 acres in size. They are about 50 to 60 percent Oakville soil and 35 to 40 percent Tell soil. The two soils occur in such intricate patterns that it was not practical to separate them in mapping.

Typically, the surface layer of the Oakville soil is dark yellowish brown, very friable loamy fine sand about 7 inches thick. It contains fragments of yellowish brown fine sand from the subsoil. The subsoil is yellowish brown, very friable fine sand about 28 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is yellowish brown, loose fine sand. The lower part is yellowish brown, loose, calcareous fine sand. In places the surface layer is darker. In some areas the soil contains more clay.

Typically, the surface layer of the Tell soil is dark brown, friable silt loam about 7 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is about 27 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, friable loam. The lower part is yellowish brown, very friable loamy sand. The substratum extends to a depth of 60 inches or more. The upper part is yellowish brown, loose loamy sand. The lower part is yellowish brown, loose fine sand. In some places, the lower part of the subsoil is thicker and contains more clay and the underlying loamy sand and fine sand are below a depth of 40 inches. In some areas the surface layer is darker. In other areas the surface soil is thicker.

Included with these soils in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower, nearly level areas. They make up 5 to 10 percent of the unit.

Water and air move through the Oakville soil at a rapid rate. They move through the upper part of the Tell soil at a moderate rate and through the lower part at a rapid rate. Surface runoff is slow on the Oakville soil and medium on the Tell soil. Available water capacity is low in the Oakville soil and moderate in the Tell soil. The content of organic matter is low in the Oakville soil and moderately low in the Tell soil. The shrink-swell potential is moderate in the Tell soil, and the potential for frost action is high.

Most areas are used for cultivated crops, hay, or pasture. The Oakville soil is poorly suited to cultivated crops because of wind erosion and droughtiness. The Tell soil is moderately suited to cultivated crops. Both soils are moderately suited to hay, pasture, and coniferous trees. The Oakville soil is well suited to dwellings. The Tell soil is well suited to dwellings with basements and moderately suited to dwellings without basements. Both soils are poorly suited to septic tank absorption fields. The Oakville soil is well suited to local roads and streets, but the Tell soil is poorly suited.

If these soils are used for corn, soybeans, or small grain, water erosion and wind erosion are hazards and droughtiness is a limitation. A crop rotation that includes forage crops and a combination of contour farming and a system of conservation tillage that leaves crop residue on the surface after planting conserve moisture and help to control erosion and maintain tilth. The low content of organic matter in the Oakville soil influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

If these soils are used for hay or pasture, wind erosion and water erosion are hazards and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. Irrigation can supply additional moisture.

If these soils are used as woodland, the equipment limitation, seedling mortality, and plant competition are management concerns. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting species that can withstand droughty conditions, by eliminating all competing vegetation near the seedlings, and by selecting the larger seedlings for planting. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

If the Tell soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing the foundations or extending the footings below the subsoil helps to overcome this limitation.

The Oakville and Tell soils readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If the Tell soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IVs.

917D2—Oakville-Tell complex, 10 to 15 percent slopes, eroded. These strongly sloping, well drained soils are on outwash plains. Individual areas are irregular in shape and range from 10 to 250 acres in size. They are about 50 to 60 percent Oakville soil and 35 to 40 percent Tell soil. The two soils occur in such intricate patterns that it was not practical to separate them in mapping.

Typically, the surface layer of the Oakville soil is dark yellowish brown, very friable loamy fine sand about 9 inches thick. It contains fragments of dark yellowish brown fine sand from the subsoil. The subsoil is dark yellowish brown, loose fine sand about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, loose fine sand. In some areas the surface layer is darker. In other areas the soil contains more clay. In a few places on north- and east-facing slopes, the slope is greater than 15 percent.

Typically, the surface layer of the Tell soil is dark brown, friable silt loam about 8 inches thick. It contains fragments of brown silt loam from the subsoil. The subsoil is about 24 inches thick. The upper part is brown, friable silt loam. The lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches or more is yellowish brown, loose fine sand. In some areas, the subsoil is thicker and the underlying fine sand is below a depth of 40 inches. In some places the surface layer is darker. In other places the surface soil is thicker. In a few areas on north- and east-facing slopes, the slope is greater than 15 percent.

Included with these soils in mapping are small areas of the somewhat poorly drained Joy soils that have a sandy substratum. These soils are in the lower, nearly level areas. They make up 2 to 5 percent of the unit.

Water and air move through the Oakville soil at a rapid rate. They move through the upper part of the Tell soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow on the Oakville soil and rapid on the Tell soil. Available water capacity is low in the Oakville soil and moderate in the Tell soil. The content of organic matter is low in the Oakville soil and moderately low in the Tell soil. The shrink-swell potential is moderate in the Tell soil, and the potential for frost action is high.

Most areas are used for hay, pasture, or cultivated crops. The Oakville soil is generally unsuited to cultivated crops because of wind erosion and droughtiness. The Tell soil is poorly suited to cultivated crops. Both soils are moderately suited to pasture, hay, and coniferous trees. They are moderately suited to dwellings and poorly suited to septic tank absorption fields. The Oakville soil is moderately suited to local roads and streets, but the Tell soil is poorly suited.

If the Tell soil is used for corn, soybeans, or small grain, further erosion is a hazard and droughtiness is a limitation. A crop rotation that includes mainly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity and conserve moisture. The low content of organic matter in the Oakville soil influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

If these soils are used for hay or pasture, wind erosion and water erosion are hazards and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and help to control wind erosion and water erosion. Planting drought-resistant species of grasses and legumes on the contour can help in establishing a vegetative cover. Irrigation can supply additional moisture.

If these soils are used as woodland, the equipment limitation, seedling mortality, and plant competition are management concerns. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting species that can withstand droughty conditions, by eliminating all competing vegetation near the seedlings, and by selecting the larger seedlings for planting. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

If these soils are used as sites for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. The shrink-swell potential in the Tell soil is a limitation on sites for dwellings without basements. Reinforcing the foundations or extending the footings below the subsoil helps to overcome this limitation.

The Oakville and Tell soils readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If the Oakville soil is used as a site for local roads and streets, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. If the Tell soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is VIs.

943D3—Seaton-Timula silt loams, 10 to 15 percent slopes, severely eroded. These strongly sloping, well drained soils are on side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 5 to 40 acres in size. They are about 55 to 60 percent Seaton soil and 30 to 40 percent Timula soil. The two soils occur in such intricate patterns that it was not practical to separate them in mapping.

Typically, the surface layer of the Seaton soil is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is yellowish brown, friable silt loam about 35 inches thick. It is mottled in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some places the soil contains more clay. In other places the surface layer is thicker. In some areas on north- and east-facing slopes, the slope is greater than 15 percent. In places the upper part of the subsoil has relict mottles. In a few areas the lower part of the subsoil and the substratum contain more sand.

Typically, the surface layer of the Timula soil is brown, friable silt loam about 5 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, mottled, very friable silt loam. The lower part is light olive brown, mottled, calcareous, very friable silt loam. The substratum to a depth of 60 inches or more

Figure 11.—Contour stripcropping in an area of Seaton-Timula silt loams, 10 to 15 percent slopes, severely eroded.

is light olive brown, mottled, calcareous, very friable silt loam and silt. In some places the surface layer and the upper part of the subsoil are calcareous. In other places the surface layer is thicker. In some areas on north- and east-facing slopes, the slope is greater than 15 percent.

Included with these soils in mapping are small areas of the somewhat poorly drained Orion and Wakeland soils. These included soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Seaton and Timula soils at a moderate rate. Surface runoff is rapid. Available water capacity is very high. The content of organic matter is low. The potential for frost action is high.

Most areas are used for cultivated crops. Some areas are used for hay. These soils are poorly suited to cultivated crops. They are moderately suited to hay and pasture, to dwellings, and to septic tank absorption fields. They are well suited to woodland. They are poorly suited to local roads and streets.

If these soils are used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes mainly forage crops and a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting help to keep soil loss within tolerable limits. Stripcropping also helps to control erosion (fig. 11). Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and productivity. The low content of organic matter in these soils influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

Establishing pasture and hay crops helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to control erosion. Grazing should be delayed until the plants are sufficiently established. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If these soils are used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If these soils are used as sites for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

If these soils are used as sites for local roads and streets, the potential for frost action is a management concern. Also, low strength is a limitation in areas of the Seaton soil. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is IVe.

943E3—Seaton-Timula silt loams, 15 to 25 percent slopes, severely eroded. These moderately steep, well drained soils are on side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 5 to 40 acres in size. They are about 55 to 60 percent Seaton soil and 30 to 40 percent Timula soil. The two soils occur in such intricate patterns that it was not practical to separate them in mapping.

Typically, the surface layer of the Seaton soil is dark yellowish brown, friable silt loam about 3 inches thick. The subsoil is yellowish brown, friable silt loam about 39 inches thick. It is mottled in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the soil contains more clay. In a few places the surface layer is thicker. In some areas on north- and east-facing slopes, the slope is greater than 25 percent. In some places the upper part of the subsoil has relict mottles. In a few areas the lower part of the subsoil and the substratum contain more sand.

Typically, the surface layer of the Timula soil is brown, friable silt loam about 3 inches thick. The subsoil is yellowish brown, friable silt loam about 19 inches thick. The substratum to a depth of 60 inches or more is brownish yellow, very friable, calcareous silt. In some areas the surface layer and the subsoil are calcareous. In other areas the surface layer is thicker. In some places on north- and east-facing slopes, the slope is greater than 25 percent.

Included with these soils in mapping are small areas of the somewhat poorly drained Orion and Wakeland soils. These included soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Seaton and Timula soils at a moderate rate. Surface runoff is rapid. Available water capacity is very high. The content of organic matter is low. The potential for frost action is high.

Most areas are used for cultivated crops or for hay. Some areas are used for pasture. These soils are generally unsuited to cultivated crops because of the erosion hazard and the slope. They are poorly suited to hay and pasture and moderately suited to woodland. They are poorly suited to dwellings and local roads and streets. They are generally unsuited to septic tank absorption fields because of the slope.

Establishing pasture and hay crops helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to control erosion. Grazing should be delayed until the plants are sufficiently established. Proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If these soils are used as woodland, the erosion hazard, the equipment limitation, and seedling mortality are management concerns. Plant competition also is a management concern. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by eliminating all competing vegetation near the seedlings and by selecting the larger seedlings for planting. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

If these soils are used as sites for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation.

If these soils are used as sites for local roads and streets, the slope and the potential for frost action are management concerns. Also, low strength is a limitation in areas of the Seaton soil. Cutting, filling, and land shaping help to overcome the slope. Strengthening or replacing the base material helps to prevent the damage caused by frost action and by low strength.

The land capability classification is VIIe.

943F2—Seaton-Timula silt loams, 18 to 35 percent slopes, eroded. These moderately steep and steep, well drained soils are on side slopes in the uplands. Individual areas are irregularly shaped or long and narrow and range from 5 to 808 acres in size. They are about 55 to 60 percent Seaton soil and 30 to 40 percent Timula soil. The two soils occur in such intricate patterns that it was not practical to separate them in mapping.

Typically, the surface layer of the Seaton soil is brown, friable silt loam about 6 inches thick. It contains fragments of yellowish brown silt loam from the subsoil. The subsoil is yellowish brown, friable silt loam about 43 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some places the soil contains more clay. In other places the surface soil is thicker. In some areas on north- and east-facing slopes, the slope is greater than 35 percent. In places the subsoil has relict mottles. In a few areas the lower part of the subsoil and the substratum contain more sand.

Typically, the surface layer of the Timula soil is brown, friable silt loam about 6 inches thick. It contains fragments of dark yellowish brown silt loam from the subsoil. The subsoil is about 22 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, mottled, calcareous, friable silt loam. The substratum to a depth of 60 inches or more is light yellowish brown, mottled, calcareous, friable silt loam. In some areas the surface layer and the upper part of the subsoil are calcareous. In other areas the surface soil is thicker. In some places on north- and east-facing slopes, the slope is greater than 35 percent.

Included with these soils in mapping are small areas of the somewhat poorly drained Orion and Lawson soils. These included soils are in narrow areas on adjacent bottom land. They make up 10 to 15 percent of the unit.

Water and air move through the Seaton and Timula soils at a moderate rate. Surface runoff is rapid. Available water capacity is very high. The content of organic matter is moderately low. The potential for frost action is high.

Most areas are used for pasture. Some areas support native timber. These soils are generally unsuited to cultivated crops because of the erosion hazard and the slope. They are moderately suited to pasture and woodland. They are generally unsuited to dwellings and septic tank absorption fields because of the slope. They are poorly suited to hay and to local roads and streets. They are suited to habitat for woodland wildlife.

Erosion control is needed during the establishment of grasses and legumes in the pastured areas. In areas where the pasture is established, interseeding legumes using a no-till system of seeding and seeding on the contour improve the quality of forage and help to control erosion. A permanent cover of pasture plants helps to control erosion and maintain tilth. Operating machinery is difficult on the steeper slopes. Selection of suitable species for planting, proper stocking rates, rotation grazing, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

If these soils are used as woodland, the erosion hazard, the equipment limitation, and seedling mortality are management concerns. Plant competition also is a management concern. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by eliminating all competing vegetation near the seedlings and by selecting the larger seedlings for planting. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

Trees and shrubs can be easily established on these soils. The existing stands of trees provide good habitat for woodland wildlife. Controlling fire and eliminating grazing of the woodland help to prevent the depletion of shrubs and sprouts, which provide food for wildlife.

If these soils are used as sites for local roads and streets, the slope and the potential for frost action are management concerns. Also, low strength is a limitation in areas of the Seaton soil. Cutting, filling, and land shaping help to overcome the slope. Strengthening or replacing the base material helps to prevent the damage caused by frost action and by low strength.

The land capability classification is VIe.

1082—Millington silt loam, wet. This nearly level, poorly drained soil is on flood plains in sloughs that are subject to ponding from February through July. It is subject to rare flooding. Individual areas are irregularly shaped or long and narrow and range from 10 to 40 acres in size.

Typically, the surface layer is black, friable, calcareous silt loam about 19 inches thick. The subsoil is black, mottled, friable, calcareous loam about 16 inches thick. The substratum to a depth of 60 inches or more is olive gray, mottled, friable, calcareous loam that has thin strata of sandy loam. In some areas the surface layer is light-colored silt loam overwash. In other areas the subsoil and the substratum contain strata of sand or loamy sand. Some areas are more frequently flooded.

Water and air move through this soil at a moderate rate. Surface runoff is ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring and early summer. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas support cattails, sedges, and other water-tolerant grasses, trees, and weeds. This soil is suited to wildlife habitat. It is generally unsuited to cultivated crops, hay, and pasture and to dwellings, septic tank absorption fields, and local roads and streets because of the flooding and the ponding.

Measures that maintain or improve the habitat are needed if this soil is used as habitat for woodland wildlife or wetland wildlife. Measures that protect the habitat from fire and grazing are also needed. The existing stands of trees provide good habitat for woodland wildlife. Wetland plants and shallow water areas, which enhance wetland wildlife habitat, can be easily established in oxbows and depressions. Maintaining seed-bearing, water-tolerant plants provides food for wildlife.

The land capability classification is Vw.

1107—Sawmill silty clay loam, wet. This nearly level, poorly drained soil is on flood plains in sloughs that are subject to ponding from February through July. It is subject to rare flooding. Individual areas are irregularly shaped or long and narrow and range from 3 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, mottled, friable silty clay loam about 9 inches thick. The subsurface layer is very dark gray, mottled, friable silty clay loam about 20 inches thick. The subsoil is dark gray, mottled, friable silty clay loam about 9 inches thick. The substratum to a depth of 60 inches or more is olive gray and dark gray, mottled, friable silty clay loam. In some places the dark surface soil is less than 24 inches thick. In other places the surface layer is light-colored silt loam overwash. Some areas are more frequently flooded. In a few areas the subsoil and the substratum contain strata of muck, sand, or loamy sand. In places the soil contains more sand throughout.

Included with this soil in mapping are small areas of Titus soils. These soils are slowly permeable. They are in landscape positions similar to those of the Sawmill soil. They make up 5 to 10 percent of the unit.

Water and air move through the Sawmill soil at a moderate rate. Surface runoff is ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring and early summer. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas support cattails, sedges, and other water-tolerant grasses, trees, and weeds. This soil is suited to wildlife habitat. It is generally unsuited to cultivated crops, hay, and pasture and to dwellings, septic tank absorption fields, and local roads and streets because of the flooding and the ponding.

Measures that maintain or improve the habitat are needed if this soil is used as habitat for woodland wildlife or wetland wildlife. Measures that protect the habitat from fire and grazing also are needed. The existing stands of trees provide good habitat for woodland wildlife. Wetland plants and shallow water areas, which enhance wetland wildlife habitat, can be easily established in oxbows and depressions. Maintaining seed-bearing, water-tolerant plants provides food for wildlife.

The land capability classification is Vw.

1334—Birds silt loam, wet. This nearly level, poorly drained soil is on flood plains that are subject to ponding from February through July. It is subject to frequent, long periods of flooding from February through June. Individual areas are long and narrow or irregularly shaped and range from 50 to 500 acres in size.

Typically, this soil is mottled, friable silt loam to a depth of 60 inches or more. The upper part is stratified dark grayish brown and grayish brown. The lower part is olive gray and dark gray. In some places the seasonal high water table is at a depth of 1 to 3 feet. In some areas a dark buried soil is within a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained, sandy Zumbro soils. These soils are in the higher, gently sloping areas that are not subject to ponding. They make up 2 to 5 percent of the unit.

Water and air move through the Birds soil at a moderately slow rate. Surface runoff is very slow or

Figure 12.—A typical area of Birds silt loam, wet. This soil provides good habitat for wetland wildlife.

ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring and early summer. Available water capacity is very high. The content of organic matter is moderately low. The potential for frost action is high.

Most areas support cattails, sedges, and other water-tolerant grasses, trees, and weeds. This soil is suited to wildlife habitat (fig. 12). It is generally unsuited to cultivated crops, hay, and pasture and to dwellings, septic tank absorption fields, and local roads and streets because of the flooding and the ponding.

Measures that maintain or improve the habitat are needed if this soil is used as habitat for woodland wildlife or wetland wildlife. Measures that protect the habitat from fire and grazing also are needed. The existing stands of trees provide good habitat for woodland wildlife. Wetland plants and shallow water areas, which enhance wetland wildlife habitat, can be easily established in oxbows and depressions. Maintaining seed-bearing, water-tolerant plants provides food for wildlife.

The land capability classification is Vw.

1381—Craigmile sandy loam, wet. This nearly level, very poorly drained soil is on flood plains that are subject to ponding from February through July. It is subject to frequent, long periods of flooding from February through June. Individual areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark gray, friable sandy loam about 4 inches thick. The subsurface layer is very dark gray, mottled, friable sandy loam about 18 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is grayish brown, mottled, friable fine sandy loam. The lower part is stratified dark yellowish brown and dark grayish brown, mottled, loose sand. In a few areas the lower part of the substratum contains more clay. In some places the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Riley and well drained Zumbro soils. These soils are not subject to ponding. Riley soils are in the slightly higher areas. Zumbro soils are in the higher, gently sloping areas. They are more sandy than the Craigmile soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Craigmile soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is very slow or ponded. The water table is 1 foot above to 1 foot below the surface during the spring and early summer. Available water capacity is moderate. The content of organic matter is moderately high. The potential for frost action is high.

Most areas support cattails, sedges, and other water-tolerant grasses, trees, and weeds. This soil is suited to wildlife habitat. It is generally unsuited to cultivated crops, hay, and pasture and to dwellings, septic tank absorption fields, and local roads and streets because of the flooding, the ponding, a poor filtering capacity, and the potential for frost action.

Measures that maintain or improve the habitat are needed if this soil is used as habitat for woodland wildlife or wetland wildlife. Measures that protect the habitat from fire and grazing also are needed. The existing stands of trees provide good habitat for woodland wildlife. Wetland plants and shallow water areas, which enhance wetland wildlife habitat, can be easily established in oxbows and depressions. Maintaining seed-bearing, water-tolerant plants provides food for wildlife.

The land capability classification is Vw.

1400—Calco silty clay loam, wet. This nearly level, poorly drained soil is on flood plains that are subject to ponding from February through July. It is frequently flooded for brief periods from February through June. Individual areas are irregularly shaped or long and narrow and range from 20 to 200 acres in size.

Typically, the surface soil is black, friable, calcareous silty clay loam about 37 inches thick. The subsoil is very dark gray, friable, calcareous silty clay loam about 12 inches thick. The substratum to a depth of 60 inches or more is dark gray, friable, calcareous loam that has thin lenses of sand. In some places the dark surface soil and the dark subsoil are less than 30 inches thick. In other places the soil is not calcareous. In places the surface soil and the subsoil contain less clay. A few areas have light-colored silt loam overwash. In some areas the soil contains more sand.

Water and air move through this soil at a moderate rate. Surface runoff is very slow or ponded. Available water capacity is very high. The content of organic matter is high. The water table is 0.5 foot above to 1.0 foot below the surface during the spring and early summer. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas support cattails, sedges, and other water-tolerant grasses, weeds, and trees. This soil is suited to wildlife habitat. It is generally unsuited to cultivated crops, hay, and pasture and to dwellings, septic tank absorption fields, and local roads and streets because of the flooding and the ponding.

Measures that maintain or improve the habitat are needed if this soil is used as habitat for woodland wildlife or wetland wildlife. Measures that protect the habitat from fire and grazing also are needed. The existing stands of trees provide good habitat for woodland wildlife. Wetland plants and shallow water areas, which enhance wetland wildlife habitat, can be easily established in oxbows and depressions. Maintaining seed-bearing, water-tolerant plants provides food for wildlife.

The land capability classification is Vw.

2087B—Dickinson-Urban land complex, 1 to 5 percent slopes. This map unit consists of the gently sloping, well drained Dickinson soil on outwash plains and stream terraces and areas of urban land. Individual areas range from 30 to 300 acres in size. They are about 55 to 60 percent Dickinson soil and 35 to 40 percent urban land. The Dickinson soil and the urban land occur as areas so intricately mixed that it was not practical to separate them in mapping.

Typically, the surface layer of the Dickinson soil is very dark gray, friable loam about 11 inches thick. The subsurface layer is very dark grayish brown, friable loam about 6 inches thick. The subsoil is about 20 inches thick. The upper part is brown and yellowish brown, friable fine sandy loam. The next part is dark yellowish brown, very friable sandy loam. The lower part is dark yellowish brown, loose loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the soil has been altered by leveling, cutting, and filling. In other areas the surface soil and the subsoil contain more sand. In some places the dark surface soil is thinner. In a few areas a seasonal high water table is at a depth of 3 to 6 feet. In a few places the surface soil and the subsoil contain more clay. In some areas the slope is as much as 8 percent.

The urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible.

Water and air move through the upper part of the Dickinson soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is medium. Available water capacity is low. The content of organic matter also is low. The potential for frost action is moderate.

The Dickinson soil is used for parks, building sites, lawns, and gardens. It is well suited to dwellings and moderately suited to recreational development. It is poorly suited to septic tank absorption fields and moderately suited to lawns and gardens and to local roads and streets.

Droughtiness is a limitation in areas used for grasses, trees, vegetables, flowers, and shrubs. Applications of supplemental water help in establishing and maintaining the plants. In areas where the soil is disturbed by grading, erosion is a hazard. Seeding grasses and mulching reduce the hazard of erosion.

The Dickinson soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Public sewer connections are generally available. Filling or mounding with suitable material increases the filtering capacity of the field.

If the Dickinson soil is used as a site for playgrounds, the slope is a limitation. Cutting and filling may be needed on selected sites. Onsite investigation is needed.

If the Dickinson soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

No land capability classification is assigned.

2198—Elburn-Urban land complex. This map unit consists of areas of the nearly level, somewhat poorly drained Elburn soil on stream terraces and outwash plains and areas of urban land. Individual areas range from 20 to 200 acres in size. They are about 55 to 60 percent Elburn soil and 35 to 40 percent urban land. The Elburn soil and the urban land occur as areas so intricately mixed that it was not practical to separate them in mapping.

Typically, the surface layer of the Elburn soil is very dark gray, friable silt loam about 13 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and yellowish brown, mottled, friable silty clay loam. The next part is brown, mottled, friable silt loam. The lower part is friable and mottled. It is stratified brown sandy loam, brown silt loam, and yellowish brown loam. In some areas the soil has been altered by leveling, cutting, and filling. In other areas a seasonal high water table is at a depth of more than 3 feet. In some places the lower part of the subsoil is silt loam throughout. In other places the dark surface layer is thinner. In a few areas the subsoil contains less clay. In a few places the lower part of the subsoil is loamy glacial till.

The urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible.

Included in mapping are small areas of the poorly drained Drummer soils in low areas that are subject to ponding. These soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Elburn soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

The Elburn soil is used for parks, building sites, lawns, and gardens. It is poorly suited to local roads and streets, to dwellings, to septic tank absorption fields, and to recreational development. It is well suited to lawns and gardens. Grasses, trees, flowers, vegetables, and shrubs grow well on this soil if fertilizer is properly applied.

If the Elburn soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundations helps to overcome this limitation.

The seasonal high water table is a limitation if the

Elburn soil is used as a site for septic tank absorption fields. Public sewer connections are generally available. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

The seasonal wetness is a limitation if the Elburn soil is used for recreational development. In picnic areas or on playgrounds, subsurface drains and diversions help to overcome the wetness. Special surfacing also helps to overcome the wetness. Onsite investigation is needed.

If the Elburn soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

No land capability classification is assigned.

2408—Aquents-Urban land complex. This map unit consists of the nearly level, poorly drained Aquents and areas of urban land. The soil material has been altered by extensive cutting and filling and is subject to ponding for brief periods from March through May. Individual areas of this unit range from 10 to 150 acres in size. They are about 55 to 60 percent Aquents and 35 to 40 percent urban land. The Aquents and the urban land occur as areas so intricately mixed that it was not practical to separate them in mapping.

Typically, the Aquents are mixed loam, loamy sand, mucky silt loam, and silty clay loam. The soil material commonly is more than 5 feet thick. In some areas nonsoil material, such as broken bricks, glass, and concrete, is incorporated into the soil material. A few areas contain thin layers of muck.

The urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible.

Water and air move through the Aquents at varying rates, depending on the degree of compaction caused by construction equipment. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter is moderately high.

Most areas of the Aquents are used for industrial or commercial development. These soils are generally unsuited to dwellings and septic tank absorption fields because of ponding. They are poorly suited to local roads and streets.

If trees, shrubs, and grasses are planted in areas of the Aquents, species that are tolerant of wetness should be selected. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available.

If the Aquents are used as sites for local roads and streets, the ponding is a hazard. Open ditches can be used to remove excess water.

No land capability classification is assigned.

2485B—Richwood-Urban land complex, 2 to 5 percent slopes. This map unit consists of areas of the gently sloping, well drained Richwood soil on stream terraces and outwash plains and areas of urban land. Individual areas range from 10 to 800 acres in size. They are about 55 to 60 percent Richwood soil and 35 to 40 percent urban land. The Richwood soil and the urban land occur as areas so intricately mixed that it was not practical to separate them in mapping.

Typically, the surface layer of the Richwood soil is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark brown, friable silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, friable silt loam. The next part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable, stratified loam and silt loam. In some places the soil has been altered by leveling, cutting, and filling. In other places a seasonal high water table is at a depth of 3 to 6 feet. In a few areas the dark surface layer is thinner. In places the lower part of the subsoil is silt loam throughout. A few areas are nearly level. In some places the lower part of the subsoil is loamy glacial till. In a few areas the soil contains more sand.

The urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible.

Included in mapping are small areas of the somewhat poorly drained Elburn soils in the lower, nearly level positions. These soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Richwood soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

The Richwood soil is used for parks, building sites, lawns, and gardens. It is moderately suited to dwellings and recreational development. It is well suited to lawns and gardens and to septic tank absorption fields. It is poorly suited to local roads and streets.

Grasses, trees, flowers, vegetables, and shrubs grow well on the Richwood soil if fertilizer is properly applied. In areas where the soil is disturbed by grading, erosion is a hazard. Seeding grasses and mulching help to control erosion.

If the Richwood soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If the Richwood soil is used as a site for playgrounds, the slope is a limitation. Cutting and filling may be needed on selected sites. Onsite investigation is needed.

If the Richwood soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

No land capability classification is assigned.

3076—Otter silt loam, frequently flooded. This nearly level, poorly drained soil is on flood plains. It is frequently flooded and ponded for brief periods from February through May. Individual areas are irregularly shaped or long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is black, friable silt loam about 10 inches thick. The subsurface layer is about 33 inches thick. In sequence downward, it is black, friable silt loam; black, mottled, friable silt loam; black, mottled, friable mucky silt loam; and very dark gray, mottled, friable silt loam. The subsoil is grayish brown, mottled, friable silt loam about 7 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam. In some areas the surface soil and the subsoil contain more clay. In other areas the substratum contains strata of sand or loamy sand. In some places the dark surface soil is less than 24 inches thick. In a few areas the seasonal high water table is at a depth of 2 to 4 feet. In a few other areas the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are small areas of the well drained Huntsville soils in the slightly higher positions on the flood plain. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Otter soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Otter soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is very high. The content of organic matter is high. The potential for frost action also is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to septic tank absorption fields and to dwellings because of the flooding and the ponding. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the ponding, and the flooding are management concerns. Strengthening or replacing the base material and building the roads above the level of the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

3077—Huntsville silt loam, frequently flooded. This well drained, nearly level soil is on flood plains. It is subject to frequent, brief periods of flooding from February through May. Individual areas are irregularly shaped or long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is friable silt loam about 25 inches thick. The upper part is very dark grayish brown, the next part is very dark gray, and the lower part is dark brown. Below this is about 15 inches of brown and yellowish brown, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown, friable silt loam. In places the dark surface soil is less than 24 inches thick. In a few areas the surface layer is light-colored silt loam overwash. In some places the soil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawson soils in the slightly lower positions. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Huntsville soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Huntsville soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the potential for frost action, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIw.

3107—Sawmill silty clay loam, frequently flooded. This nearly level, poorly drained soil is on flood plains. It is frequently flooded and ponded for brief periods from February through May. Individual areas are irregularly shaped or elongated and range from 20 to 200 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam about 8 inches thick. The subsurface layer is about 21 inches thick. The upper part is very dark gray, friable silty clay loam. The lower part is very dark gray, mottled, firm silty clay loam. The subsoil extends to a depth of 60 inches or more. The upper part is dark gray, mottled, firm silty clay loam. The next part is dark grayish brown, mottled, friable silt loam. The lower part is gray, mottled, friable, stratified clay loam, silty clay loam, and sandy loam. In some areas the dark surface soil is less than 24 inches thick. In some places the soil contains less clay. In other places the subsoil has strata of loamy sand or sand. In a few areas the surface layer is light-colored silt loam overwash. In a few places the soil contains more clay.

Included with this soil in mapping are a few small areas, in the slightly higher positions and farther from stream channels than the Sawmill soil, that are only rarely flooded. These areas make up 5 to 10 percent of the unit.

Water and air move through the Sawmill soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the ponding. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water if suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the ponding, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

3302—Ambraw silty clay loam, frequently flooded. This nearly level, poorly drained soil is on flood plains. It is frequently flooded and ponded for brief periods from February through May. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam about 10 inches thick. The subsurface layer is very dark gray, friable clay loam about 10 inches thick. The subsoil is friable clay loam about 5 inches thick. It is mottled. The upper part is dark gray, and the lower part is grayish brown. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable clay loam that has thin strata of sandy clay loam. In some areas the dark surface soil is more than 24 inches thick. In other areas the soil contains more clay. In places the subsoil contains free carbonates throughout. In a few areas the soil contains more sand.

Included with this soil in mapping are small areas of the moderately well drained Medway soils in the slightly higher positions on the flood plain. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Ambraw soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Ambraw soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is very slow or ponded. The water table is 3 feet above to 1 foot below the surface during the spring. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields because of the flooding, the ponding, and the moderately slow permeability. It is generally unsuited to dwellings because of the ponding and the flooding.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches can remove excess water where suitable outlets are available. Flooding normally does not affect crops during growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the ponding, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IVw.

3321A—Du Page silt loam, frequently flooded, 0 to 3 percent slopes. This nearly level, moderately well drained soil is on flood plains. It is frequently flooded for brief periods from February through May. Individual areas are irregular in shape and range from 10 to 400 acres in size.

Typically, the surface layer is very dark gray, friable, calcareous silt loam about 9 inches thick. The subsurface layer is about 25 inches thick. The upper part is very dark grayish brown, friable, calcareous silt loam. The next part is very dark grayish brown, friable, calcareous loam. The lower part is dark brown, friable, calcareous loam. The substratum to a depth of 60 inches or more is dark grayish brown, friable, calcareous loam that has thin strata of brown sandy loam. It is mottled in the lower part. In some places the seasonal high water table is at a depth of more than 6 feet. In other places the seasonal high water table is at a depth of 2 to 4 feet. In some areas the dark surface soil is less than 24 inches thick. In a few places the soil is not calcareous throughout. In some places the substratum contains subhorizons of sand or loamy sand. In a few areas the soil contains less sand.

Included with this soil in mapping are small areas of the poorly drained Ambraw and Millington soils. These soils are lower on the landscape than the Du Page soil. Ambraw soils are not calcareous. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Du Page soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Du Page soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The content of organic matter is moderately high. The water table is at a depth of 4 to 6 feet during the spring. The shrink-swell potential is moderate. The potential for frost action also is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding. It is poorly suited to local roads and streets.

The major cultivated crops are corn and soybeans. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. The high lime content of this soil affects the availability of many plant nutrients and influences the effectiveness of herbicides. More frequent applications of fertilizer are needed to correct nutrient imbalances. The applications of herbicides should be adjusted as the level of alkalinity increases. Returning crop residue to the soil minimizes crusting and helps to maintain tilth.

If this soil is used as a site for local roads and streets, low strength and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIw.

3333—Wakeland silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains along the major streams and tributaries. It is frequently flooded for brief periods from February through May. Individual areas are irregularly shaped or long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The substratum to a depth of 60 inches or more is stratified brown, dark grayish brown, and yellowish brown, mottled, friable silt loam. In some areas the surface layer is darker. In other areas the seasonal high water table is at a depth of more than 3 feet. A few areas have strata of loamy sand or sand above a depth of 40 inches. In some areas the seasonal high water table is within a depth of 1 foot. In places the substratum has subhorizons of gravel. Some areas have a dark buried soil above a depth of 40 inches.

Included with this soil in mapping are a few small areas, in the slightly higher positions and farther from stream channels than the Wakeland soil, that are only rarely flooded. These areas make up 5 to 10 percent of the unit.

Water and air move through the Wakeland soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderately low. The water table is at a depth of 1 to 3 feet during the spring. The potential for frost action is high.

Most areas are used for cultivated crops or pasture. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the seasonal high water table. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. The seasonal high water table also can delay planting in some years. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting varieties adapted to a shorter growing season and wetter conditions also reduces the extent of this damage. Subsurface tile drains function satisfactorily if suitable outlets are available. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

If this soil is used for pasture or hay, the flooding is a hazard and the seasonal high water table is a limitation. Dikes and diversions help to control the flooding, and subsurface tile drains lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. The flooding delays the harvesting of hay in some years.

If this soil is used as a site for local roads and streets, the potential for frost action and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIw.

3400—Calco silty clay loam, frequently flooded. This nearly level, poorly drained soil is on flood plains. It is frequently flooded (fig. 13) and ponded for brief periods from February through May. Individual areas are irregular in shape and range from 20 to 200 acres in size.

Typically, the surface layer is very dark gray, friable, calcareous silty clay loam about 8 inches thick. The subsurface layer also is very dark gray, friable, calcareous silty clay loam. It is about 26 inches thick. The subsoil is very dark gray, mottled, friable, calcareous silty clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is dark gray, friable, calcareous, stratified loam, silt loam, and sandy loam. In some places the dark surface soil and the dark subsoil are less than 30 inches thick. In other places the substratum contains subhorizons of sand or loamy sand. Some areas have a surface layer of light-colored silt loam overwash. In a few areas the surface soil and the subsoil contain less clay.

Included with this soil in mapping are small areas of the moderately well drained Du Page soils. These soils are in the slightly higher positions on the flood plain. They contain more sand in the surface soil and the subsoil than the Calco soil. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Calco soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Calco soil at a moderate rate. Surface runoff is very slow or ponded. Available water capacity is very high. The content of organic matter is high. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the ponding. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard and the seasonal high water table is a limitation. The flooding occurs less often than once every 2 years during the growing season. A drainage system has been installed in most areas. Measures that maintain the drainage system are needed. Additional drainage may be needed in some areas. Subsurface tile drains function satisfactorily if suitable outlets are available. Dikes or diversions can reduce the extent of the crop damage caused by floodwater. A conservation tillage system that leaves crop residue on the surface after planting improves tilth, helps to prevent surface compaction and crusting, and increases the rate of water infiltration.

The land capability classification is IIw.

Figure 13.—Early spring flooding in an area of Calco silty clay loam, frequently flooded.

3404—Titus silty clay loam, frequently flooded. This nearly level, poorly drained soil is on flood plains. It is frequently flooded and ponded for brief periods from February through May. Individual areas are irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is very dark gray, firm silty clay loam about 7 inches thick. The subsurface layer is very dark gray, firm silty clay about 7 inches thick. The subsoil is about 35 inches thick. The upper part is dark gray, mottled, firm silty clay. The next part is gray, mottled, firm silty clay loam. The lower part is dark gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled, firm silty clay loam. In some places the surface soil and the subsoil contain less clay. In other places the dark surface soil is more than 24 inches thick. In a few areas the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are a few small areas, in the slightly higher positions and farther from stream channels than the Titus soil, that are only rarely flooded. These areas make up 5 to 10 percent of the unit.

Water and air move through the Titus soil at a slow rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is high. The potential for frost action also is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops and is well suited to hay and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields because of the ponding, the flooding, and the slow permeability. It is generally unsuited to dwellings because of the flooding, the ponding, and the high shrink-swell potential.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the high shrink-swell potential and low strength are limitations and the ponding is a hazard. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IVw.

3415—Orion silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains along the major streams and tributaries. It is frequently flooded for brief periods from February through May. Individual areas are irregularly shaped or long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. Below this is about 29 inches of dark grayish brown, mottled, friable silt loam that has thin strata of yellowish brown, brown, and pale brown silt loam. The next layer to a depth of 60 inches or more is a buried soil. The upper part is a buried surface layer of black, friable silt loam. The lower part is a buried subsurface layer of black and very dark gray, friable silty clay loam. In some areas the surface layer and the stratified sediments are darker. In a few places the seasonal high water table is at a depth of 3 to 6 feet. In places the buried soil is below a depth of 40 inches. In some areas the seasonal high water table is within a depth of 1 foot. In a few areas the soil has stratified layers that contain more sand in the upper part.

Water and air move through this soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderately low. The water table is at a depth of 1 to 3 feet during the spring. The potential for frost action is high.

Most areas are used for cultivated crops or pasture. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the seasonal high water table. It is poorly suited to local roads and streets. It is moderately suited to woodland.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. The seasonal high water table also can delay planting in some years. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting varieties adapted to a shorter growing season and wetter conditions also reduces the extent of this damage. Subsurface tile drains function satisfactorily if suitable outlets are available. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

If this soil is used for pasture or hay, the flooding is a hazard and the seasonal high water table is a limitation. Dikes and diversions help to control the flooding, and subsurface tile drains lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. The flooding delays the harvesting of hay in some years.

If this soil is used as woodland, the equipment limitation is a management concern. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for local roads and streets, low strength, the potential for frost action, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIIw.

3428—Coffeen silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains along the major streams and tributaries. It is frequently flooded for brief periods from February through May. Individual areas are irregularly shaped or long and narrow and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 17 inches thick. The subsoil is about 29 inches thick. The upper part is brown, mottled, friable silt loam. The lower part is grayish brown, mottled, friable, stratified silt loam and loam. The substratum to a depth of 60 inches or more is grayish brown and brown, mottled, friable silt loam. In some places the soil contains more clay. In other places the seasonal high water table is at a depth of 3 to 6 feet. In a few areas the dark surface soil is more than 24 inches thick. In other areas the dark surface soil is less than 10 inches thick. In a few places the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are a few small areas, in the slightly higher positions and farther from stream channels than the Coffeen soil, that are only rarely flooded. Also included are small areas of the poorly drained Beaucoup soils in low areas that are subject to ponding. Included areas make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Coffeen soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is high. The content of organic matter is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the seasonal high water table.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Also, the seasonal high water table delays planting in some years. Flooding is less frequent than once every 2 years during the growing season. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting varieties adapted to a shorter growing season and wetter soil conditions also reduces the extent of this damage. Subsurface tile drains function satisfactorily if suitable outlets are available. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

The land capability classification is IIw.

3451—Lawson silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains along the major streams and tributaries. It is frequently flooded for brief periods from February through May. Individual areas are irregularly shaped or long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 27 inches thick. It is mottled in the lower part. Below this is about 9 inches of dark grayish brown, mottled, friable silt loam. The substratum extends to a depth of 60 inches or more. The upper part is grayish brown, mottled, friable silt loam. The lower part is grayish brown and dark grayish brown, mottled, friable loam. In some places the dark surface soil is less than 24 inches thick. In other places the surface layer is light-colored silt loam overwash. In a few areas a dark buried soil of silty clay loam is within a depth of 40 inches. In a few places the surface soil contains more sand.

Included with this soil in mapping are small areas of the well drained Huntsville and poorly drained Otter soils. Huntsville soils are in the slightly higher positions. Otter soils are in the lower positions that are subject to ponding. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Lawson soil at a moderate rate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during the spring. Available water capacity is very high. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the seasonal high water table. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. The seasonal high water table also can delay planting in some years. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting varieties adapted to a shorter growing season and wetter conditions also reduces the extent of this damage. Subsurface tile drains function satisfactorily if suitable outlets are available. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

If this soil is used for pasture or hay, the flooding is a hazard and the seasonal high water table is a limitation. Dikes and diversions help to control the flooding, and subsurface tile drains lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. The flooding delays the harvesting of hay in some years.

If this soil is used as a site for local roads and streets, the potential for frost action and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIIw.

3452—Riley loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods from February through May. Individual areas are irregular in shape and range from 20 to 100 acres in size.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 9 inches thick. The subsoil is about 17 inches thick. The upper part is brown, mottled, friable clay loam. The lower part is brown, mottled, friable sandy clay loam. The substratum extends to a depth of 60 inches or more. The upper part is stratified dark grayish brown and yellowish brown, very friable loamy sand. The lower part is yellowish brown, mottled, loose sand. In places, the subsoil is thicker and loamy sand and sand are below a depth of 40 inches. In some areas the dark surface soil is less than 10 inches thick. In some places the lower part of the subsoil and the substratum contain free carbonates. In other places the seasonal high water table is at a depth of 3 to 6 feet. In a few areas the surface soil and the subsoil contain more sand.

Included with this soil in mapping are small areas of the poorly drained Ambraw soils in low areas that are subject to ponding. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Riley soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Riley soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. Available water capacity is moderate. The content of organic matter is moderately high. The water table is at a depth of 1.5 to 3.0 feet during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings because of the seasonal high water table and the flooding. It is generally unsuited to septic tank absorption fields because of the seasonal high water table, the flooding, and a poor filtering capacity. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard and droughtiness is a limitation in midsummer. A system of conservation tillage that leaves crop residue on the surface after planting reduces crusting, helps to maintain tilth, and conserves moisture. Subsurface drains or surface ditches may be needed to allow for timely tillage in the spring. Subsurface drains and surface ditches can remove excess water where suitable outlets are available. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur.

If this soil is used as a site for local roads and streets, low strength, the potential for frost action, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is IIIw.

7070—Beaucoup silty clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May. It is subject to rare flooding. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 34 inches thick. It is mottled. The upper part is dark gray and grayish brown, and the lower part is light brownish gray. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray, mottled, friable silt loam. In some areas the surface soil and the subsoil contain more clay. In other areas the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Coffeen soils in the slightly higher positions that are not subject to ponding. Also included are a few small areas near drainageways that are more frequently flooded than the Beaucoup soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Beaucoup soil at a moderately slow rate. Surface runoff is very slow or ponded. Available water capacity is high. The content of organic matter also is high. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings because of the ponding and the flooding. It is generally unsuited to septic tank absorption fields because of the ponding and the moderately slow permeability. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, low strength and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

7073—Ross loam, rarely flooded. This nearly level, well drained soil is on low stream terraces and flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark gray, friable loam about 11 inches thick. The subsurface layer is dark brown, friable loam about 5 inches thick. The subsoil is about 34 inches thick. The upper part is dark brown and brown, friable loam. The next part is dark yellowish brown, friable sandy loam. The lower part is very dark grayish brown, friable sandy loam. The substratum to a depth of 60 inches or more is brown, mottled, friable sandy loam. In some places the soil contains more sand and less clay. In other places the soil contains subhorizons of reddish brown silty clay or clay.

Included with this soil in mapping are small areas of the poorly drained Ambraw soils in low areas that are subject to ponding. Also included are a few small areas near drainageways that are more frequently flooded than the Ross soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Ross soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 4 to 6 feet during the spring. Available water capacity is high. The content of organic matter is moderately high. The potential for frost action is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to septic tank absorption fields. It is generally unsuited to dwellings because of the flooding. It is moderately suited to local roads and streets.

No major limitations affect the use of this soil for corn, soybeans, or small grain. A system of conservation tillage that leaves crop residue on the surface after planting helps to prevent crusting and maintain tilth.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation and the flooding is a hazard. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water. The flooding can be overcome by adding suitable fill material to raise the filter system above the level of flooding.

If this soil is used as a site for local roads and streets, low strength, the potential for frost action, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage.

The land capability classification is I.

7076—Otter silt loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is about 30 inches thick. The upper part is black, friable silt loam. The next part is black, friable mucky silt loam. The lower part is very dark gray and black, mottled, friable silt loam. The subsoil is dark grayish brown, mottled, friable silt loam about 12 inches thick. The substratum to a depth of 60 inches or more is mottled grayish brown and light olive brown, friable silt loam. In some places the surface soil and the subsoil contain more clay. In other places the soil has strata of sand, loamy sand, or muck. In a few areas the seasonal high water table is at a depth of 2 to 4 feet. In a few other areas the dark surface soil is less than 24 inches thick. In a few places the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Otter soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Otter soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is very high. The content of organic matter is high. The potential for frost action also is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to septic tank absorption fields and to dwellings because of the ponding and the flooding. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, low strength and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

7082—Millington clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May and to rare flooding. Individual areas are irregularly shaped or long and narrow and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable, calcareous clay loam about 9 inches thick. The subsurface layer is very dark gray, mottled, friable, calcareous clay loam about 12 inches thick. The subsoil is about 16 inches thick. It is mottled, friable, and calcareous. The upper part is dark grayish brown clay loam, and the lower part is grayish brown loam. The substratum to a depth of 60 inches or more is friable and calcareous. It is stratified gray loam and dark gray and very dark gray silty clay loam. In some places the subsoil and the substratum contain strata of sand or loamy sand. In a few areas the surface soil and the subsoil contain less sand. Some areas are not subject to ponding.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Millington soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Millington soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. The high lime content of the soil affects the availability of many plant nutrients and influences the effectiveness of herbicides. More frequent applications of fertilizer are needed to correct nutrient imbalances. The applications of herbicide should be adjusted as the level of alkalinity increases. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

7100—Palms muck, rarely flooded. This nearly level, very poorly drained soil is in depressions on flood plains. It is subject to ponding for brief periods from November through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 5 to 150 acres in size.

Typically, the surface layer is black, friable muck about 28 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled. The upper part is very dark gray, friable mucky silt loam. The next part is gray, friable silt loam. The lower part is gray, calcareous, friable silt loam. In some places the soil is muck to a depth of 60 inches or more. In other places the substratum is reddish brown silty clay or clay. In a few areas the lower part of the substratum is loamy sand or sand.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Palms soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the organic material in the Palms soil at a moderately slow to moderately rapid rate and through the underlying silty material at a moderate rate. Surface runoff is very slow or ponded. Available water capacity is very high. The content of organic matter also is very high. The water table is 1 foot above to 1 foot below the surface during the spring. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to dwellings because of the flooding, the ponding, and subsidence. It is generally unsuited to septic tank absorption fields because of the ponding and subsidence. It is generally unsuited to local roads and streets because of the ponding, the potential for frost action, and subsidence.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function 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.

The land capability classification is IIIw.

7103—Houghton muck, rarely flooded. This nearly level, very poorly drained soil is in depressions on flood plains. It is subject to ponding for brief periods from November through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 10 to 400 acres in size.

Typically, the soil is black, friable muck to a depth of 60 inches or more. In some areas the soil has a surface layer of light-colored silt loam overwash. In places the soil has strata of sand or loamy sand.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Houghton soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Houghton soil at a moderately slow to moderately rapid rate. Surface runoff is very slow or ponded. The water table is 1 foot above to 1 foot below the surface during the spring. Available water capacity is very high. The content of organic matter also is very high. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to septic tank absorption fields because of the ponding, subsidence, and the moderately slow permeability. It is generally unsuited to dwellings because of the flooding, the ponding, and subsidence. It is generally unsuited to local roads and streets because of the ponding, subsidence, and the potential for frost action.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function 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.

The land capability classification is IIIw.

7107—Sawmill silty clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 10 to 200 acres in size.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is friable silty clay loam about 25 inches thick. The upper part is black, and the lower part is dark olive gray and is mottled. The subsoil extends to a depth of 60 inches or more. It is dark gray and olive gray, mottled, friable silt loam that has thin strata of sandy loam. In some areas the dark surface soil is less than 24 inches thick. In some places the soil contains more clay. In other places the soil contains less clay. In a few areas the subsoil has strata of loamy sand or sand. In other areas the surface layer is light-colored silt loam overwash. In a few places the soil has strata of muck.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Sawmill soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Sawmill soil at a moderate rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, low strength and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

7210—Lena muck, rarely flooded. This nearly level, very poorly drained soil is in depressions on flood plains. It is subject to ponding for brief periods from November through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 5 to 50 acres in size.

Typically, the soil is black, friable, calcareous muck to a depth of 60 inches or more. In some places the soil has a surface layer of light-colored silt loam overwash. In other places the soil has strata of sand or loamy sand. In a few areas a substratum of silt loam is within a depth of 50 inches.

Included with this soil in mapping are small areas of Houghton soils. These soils are not calcareous. They are in positions on the landscape similar to those of the Lena soil. Also included are a few small areas near drainageways that are more frequently flooded than the Lena soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lena soil at a moderately slow to moderately rapid rate. Surface runoff is very slow or ponded. Available water capacity is very high. The content of organic matter also is very high. The water table is 1 foot above to 1 foot below the surface during the spring. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to dwellings because of the flooding, the ponding, and subsidence. It is generally unsuited to septic tank absorption fields because of the ponding, subsidence, and the moderately slow permeability. It is generally unsuited to local roads and streets because of the ponding, the potential for frost action, and subsidence.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function well, however, because the soil is subject to subsidence. The high lime content of this soil affects the availability of many plant nutrients and influences the effectiveness of herbicides. More frequent applications of fertilizer are needed to correct nutrient imbalances. The applications of herbicides should be adjusted as the level of alkalinity increases. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

The land capability classification is IIIw.

7302—Ambraw clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May and to rare flooding. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is black, friable clay loam about 10 inches thick. The subsurface layer is very dark gray, mottled, friable clay loam about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark gray, mottled, friable clay loam. The next part is grayish brown, mottled, friable clay loam. The lower part is grayish brown, mottled, friable clay loam stratified with thin lenses of gray sandy clay loam. The substratum to a depth of 60 inches or more is friable and mottled. It is stratified grayish brown clay loam, very dark grayish brown sandy clay loam, and brown loamy sand. In some places the dark surface soil is more than 24 inches thick. In other places the soil contains more clay. In a few areas the soil contains more sand. In a few places hard, fractured limestone bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of the moderately well drained Medway soils in the slightly higher positions on the flood plain. Also included are a few small areas near drainageways that are more frequently flooded than the Ambraw soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Ambraw soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is very slow or ponded. Available water capacity is high. The content of organic matter is moderately high. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings because of the flooding and the ponding. It is generally unsuited to septic tank absorption fields because of the ponding and the moderately slow permeability.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, low strength and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

7345—Elvers silt loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from November through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The upper part of the underlying material is stratified grayish brown and dark grayish brown, mottled, friable silt loam about 20 inches thick. The lower part of the underlying material to a depth of 60 inches or more is black, friable muck. In some places the underlying layer of muck is below a depth of 40 inches. In other places the soil contains muck throughout the profile. In a few areas the seasonal high water table is not ponded on the surface. In some areas a layer of mucky silt loam is above the underlying muck.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils. These soils are in the slightly higher positions on the flood plain. They are not muck in the underlying material. Also included are a few small areas near drainageways that are more frequently flooded than the Elvers soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the silty sediments in the Elvers soil at a moderate rate and through the underlying organic material at a moderately rapid rate. Surface runoff is slow to ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is very high. The content of organic matter is low. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding, the ponding, and low strength.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface ditches remove excess water where suitable outlets are available. Tile drains do not function well, however, because the underlying layer of muck is subject to subsidence. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the ponding and the potential for frost action are management concerns. Open ditches can be used to remove excess water. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The land capability classification is IIw.

7349B—Zumbro sandy loam, rarely flooded, 1 to 4 percent slopes. This gently sloping, well drained soil is on flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface soil is about 25 inches thick. The upper part is very dark brown, friable sandy loam. The lower part is dark brown, very friable loamy sand. The subsoil is brown, very friable loamy sand about 9 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. It is mottled in the lower part. In some places the surface soil contains thin subhorizons of loam. In other places the subsoil and the substratum contain thin subhorizons of loam. In some areas the subsoil and the substratum contain thin strata of reddish brown loam, clay loam, silty clay, or clay. In a few areas the dark surface soil is thinner. In other areas a seasonal high water table is between depths of 4 and 6 feet. In some places the soil contains more clay throughout.

Included with this soil in mapping are small areas of the moderately well drained Medway and somewhat poorly drained Riley soils. These soils are in nearly level areas and are slightly lower on the flood plain than the Zumbro soil. They are less droughty than the Zumbro soil. Also included are a few small areas near stream channels that are more frequently flooded than the Zumbro soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Zumbro soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is slow. Available water capacity is low. The content of organic matter is moderate.

Most areas are used for cultivated crops. This soil is poorly suited to cultivated crops, hay, and pasture and to septic tank absorption fields. It is moderately suited to local roads and streets. It is generally unsuited to dwellings because of the flooding.

If this soil is used for corn, soybeans, or small grain, wind erosion is a hazard and droughtiness is a limitation. Stripcropping and a system of conservation tillage that leaves crop residue on the surface after planting help to control wind erosion and conserve moisture. Winter cover crops and field windbreaks also help to control wind erosion. The moderate content of organic matter influences the effectiveness of herbicides. The applications of herbicides should be adjusted accordingly.

In areas used for hay or pasture, wind erosion is a hazard and droughtiness is a limitation, particularly during the establishment of the plants. Pasture rotation, delayed grazing, proper stocking rates, and applications of fertilizer help to keep the pasture in good condition and reduce the hazard of wind erosion. Planting drought-resistant species of grasses and legumes can help in establishing a vegetative cover.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, the flooding is a management concern. Building the roads at a level above the flood plain helps to prevent damage.

The land capability classification is IIIs.

7404—Titus silty clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to ponding for brief periods from February through May and to rare flooding. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer is about 14 inches thick. The upper part is very dark gray, friable silty clay loam, and the lower part is very dark gray, firm silty clay loam. The subsoil extends to a depth of 60 inches or more. The upper part is dark gray, mottled, firm silty clay. The next part is dark gray, mottled, firm silty clay loam. The lower part is grayish brown, mottled, friable silty clay loam that has a few thin strata of clay loam. In places the soil contains less clay. In a few areas the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Titus soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Titus soil at a slow rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter is moderately high. The shrink-swell potential is high. The potential for frost action also is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops and is well suited to hay and pasture. It is poorly suited to local roads and streets. It is generally unsuited to septic tank absorption fields because of the ponding and the slow permeability. It is generally unsuited to dwellings because of the flooding, the ponding, and the high shrink-swell potential.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, help to prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, the high shrink-swell potential, low strength, and the ponding are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

7428—Coffeen silt loam, rarely flooded. This nearly level, somewhat poorly drained soil is on flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is friable silt loam about 11 inches thick. The upper part is very dark brown, and the lower part is dark brown and is mottled. The subsoil is about 19 inches thick. It is mottled. The upper part is brown, friable silt loam. The next part is grayish brown, friable silt loam. The lower part is grayish brown, very friable fine sandy loam. The substratum extends to a depth of 60 inches or more. It is mottled and friable. The upper part is grayish brown and light brownish gray silt loam that has strata of fine sandy loam. The lower part is gray silt loam. In some places the dark surface soil is more than 24 inches thick. In other places the dark surface soil is less than 10 inches thick. In some areas the soil contains more clay. Some places have a surface layer of light-colored silt loam overwash. In a few areas the seasonal high water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are small areas of the poorly drained Beaucoup soils in low areas that are subject to ponding. Also included are a few small areas near drainageways that are more frequently flooded than the Coffeen soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Coffeen soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. Available water capacity is high. The content of organic matter is moderate. The water table is at a depth of 1 to 3 feet during the spring. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to septic tank absorption fields. It is generally unsuited to dwellings because of the flooding and the seasonal high water table. It is poorly suited to local roads and streets.

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, the potential for frost action is a management concern. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

7452—Riley loam, rarely flooded. This nearly level, somewhat poorly drained soil is on flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable clay loam about 9 inches thick. The subsoil is about 14 inches thick. The upper part is dark grayish brown, mottled, friable clay loam. The lower part is brown, mottled, friable loam. The substratum extends to a depth of 60 inches or more. The upper part is stratified dark grayish brown sandy loam and brown sand. It is mottled and very friable. The lower part is yellowish brown and brownish yellow, mottled, loose sand that has thin strata of coarse sand. In some places, the subsoil is thicker and the underlying sand is below a depth of 40 inches. In some areas the dark surface soil is less than 10 inches thick. In some places the lower part of the subsoil and the substratum contain free carbonates. In other places the seasonal high water table is at a depth of 3 to 6 feet. In a few areas the surface layer is light-colored silt loam overwash. In a few places the surface soil and the subsoil contain more sand.

Included with this soil in mapping are small areas of the poorly drained Ambraw soils in low areas that are subject to ponding. Also included are a few small areas near drainageways that are more frequently flooded than the Riley soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Riley soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. The water table is at a depth of 1.5 to 3.0 feet during the spring. Available water capacity is moderate. The content of organic matter is moderately high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to septic tank absorption fields and local roads and streets. It is generally unsuited to dwellings because of the seasonal high water table and the hazard of flooding.

If this soil is used for corn, soybeans, or small grain, droughtiness is a limitation in midsummer. A system of conservation tillage that leaves crop residue on the surface after planting minimizes crusting, helps to maintain tilth, and conserves moisture. Subsurface drains or surface ditches may be needed to allow for timely tillage in the spring. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. Drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table is a limitation. If suitable outlets are available, underground drains enclosed by filter or envelope material can lower the water table. Diverting surface water from the filter bed helps to keep the system functioning properly. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water. Filling or mounding with suitable material increases the filtering capacity of the field.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

7516—Faxon silty clay loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 40 to 200 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is very dark gray, mottled, friable silty clay loam about 7 inches thick. The subsoil is about 11 inches thick. It is mottled. The upper part is dark grayish brown, friable silty clay loam. The lower part is olive gray, calcareous, friable silt loam. Hard, fractured limestone bedrock is at a depth of about 27 inches. In some areas the limestone bedrock is at a depth of 10 to 20 inches. In other areas the limestone bedrock is below a depth of 40 inches. In some places the subsoil contains more clay. In a few areas the seasonal high water table is at a depth of 1 to 3 feet. In a few places the seasonal high water table is ponded on the surface.

Water and air move through this soil at a moderate rate. Surface runoff is slow. The water table is at the surface to 1 foot below the surface during the spring. Available water capacity is low. The content of organic matter is high. Root growth is restricted by limestone bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. The potential for frost action is high.

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

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface ditches help to remove excess water where suitable outlets are available. Tile drains are difficult to install because of the limestone bedrock within a depth of 40 inches. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

In areas used for pasture, including grasses and legumes in the cropping sequence helps to maintain tilth. Selection of suitable species for planting, proper stocking rates, applications of fertilizer, and restricted use during wet periods help to keep the pasture in good condition.

If this soil is used as a site for local roads and streets, the potential for frost action and the seasonal wetness are management concerns. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIIw.

7603—Blackoar silt loam, rarely flooded. This nearly level, poorly drained soil is on flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 10 to 500 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 13 inches thick. The subsoil is friable silt loam about 45 inches thick. It is mottled. The upper part is dark grayish brown, and the lower part is dark grayish brown and dark gray. The substratum to a depth of 60 inches or more is dark gray, mottled, friable silt loam. In some places the seasonal high water table is at a depth of 1 to 3 feet. In other places the soil contains more clay. In a few areas the dark surface soil is more than 24 inches thick. In some areas the subsoil and the substratum have free carbonates. In a few places the surface layer is light-colored silt loam overwash.

Included with this soil in mapping are small areas near drainageways that are more frequently flooded than the Blackoar soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the Blackoar soil at a moderate rate. Surface runoff is very slow. The water table is at the surface to 1 foot below the surface during the spring. Available water capacity is very high. The content of organic matter is moderately high. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to septic tank absorption fields and to dwellings because of the seasonal high water table and the flooding. It is poorly suited to local roads and streets.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches function satisfactorily if suitable outlets are available. Applying a conservation tillage system that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, prevent surface compaction and crusting, and increase the rate of water infiltration.

If this soil is used as a site for local roads and streets, the seasonal high water table and low strength are limitations. Strengthening or replacing the base material helps to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

7682—Medway loam, rarely flooded. This nearly level, moderately well drained soil is on flood plains. It is subject to rare flooding. Individual areas are 10 to 400 acres in size.

Typically, the surface layer is black, friable loam about 11 inches thick. The subsurface layer is very dark grayish brown, friable loam about 8 inches thick. The subsoil is about 31 inches thick. The upper part is brown, mottled, friable loam. The next part is brown, mottled, friable clay loam. The lower part is yellowish brown, mottled, friable sandy clay loam that has thin strata of sandy loam and gravelly sandy loam. The substratum extends to a depth of 60 inches or more. It is mottled and very friable. It is stratified dark grayish brown sandy loam and loamy sand and brown and yellowish brown sand. In some places the dark surface soil is more than 24 inches thick. In other places the dark surface soil is less than 10 inches thick. A few areas have subhorizons of sand or loamy sand within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Ambraw and moderately well drained Du Page soils. Ambraw soils are in slight depressions that are subject to ponding. Du Page soils contain free carbonates throughout and have a dark surface soil that is more than 24 inches thick. They are in landscape positions similar to those of the Medway soil. Also included are a few small areas near drainageways that are more frequently flooded than the Medway soil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Medway soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. Surface runoff is slow. The water table is at a depth of 1.5 to 3.0 feet during the spring. Available water capacity is high. The content of organic matter is moderately high. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to septic tank absorption fields and local roads and streets. It is generally unsuited to dwellings because of the seasonal high water table and the flooding.

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains lowers the water table. Grading and land shaping help to remove excess surface water.

If this soil is used as a site for local roads and streets, low strength and the potential for frost action are management concerns. Strengthening or replacing the base material helps to prevent damage.

The land capability classification is I.

7777—Adrian muck, rarely flooded. This nearly level, very poorly drained soil is in depressions on flood plains. It is subject to ponding for brief periods from November through May and to rare flooding. Individual areas are irregularly shaped or elongated and range from 5 to 80 acres in size.

Typically, the surface layer is black, friable muck about 30 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is dark grayish brown, mottled, very friable loamy sand. The lower part is brown, yellowish brown, and pale brown, loose sand. In some places the soil is muck to a depth of 60 inches or more. In a few areas the substratum contains more clay. In some areas the substratum is coarse sand.

Included with this soil in mapping are a few small areas near drainageways that are more frequently flooded than the Adrian soil. These areas make up 5 to 10 percent of the unit.

Water and air move through the organic material in the Adrian soil at a moderately slow to moderately rapid rate and through the underlying sandy material at a rapid rate. Surface runoff is very slow or ponded. The water table is 1 foot above to 1 foot below the surface during the spring. Available water capacity is very high. The content of organic matter also is very high. The potential for frost action is high. This soil is subject to subsidence.

Most areas are used for cultivated crops. This soil is suited to cultivated crops. It is poorly suited to hay and pasture because of the ponding and excess humus. It is generally unsuited to septic tank absorption fields because of the ponding, subsidence, and a poor filtering capacity. It is generally unsuited to dwellings because of the flooding, the ponding, and subsidence. It is generally unsuited to local roads and streets because of the ponding, subsidence, and low strength.

If drained, this soil can be used for the crops commonly grown, such as corn and soybeans. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Tile drains do not function 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.

The land capability classification is IVw.

8107+—Sawmill silt loam, overwash, occasionally flooded. This nearly level, poorly drained soil is on flood plains. It is occasionally flooded for brief periods from February through May. Individual areas are irregular in shape and range from 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam overwash about 8 inches thick. The next layer is about 6 inches of dark grayish brown, mottled, friable silt loam overwash that has thin strata of yellowish brown, brown, pale brown, and very dark grayish brown silt loam. Below this to a depth of 60 inches or more is a buried soil of friable silty clay loam. The upper part is very dark gray. The next part is very dark gray and very dark grayish brown and is mottled. The lower part is dark grayish brown and is mottled. In some areas the buried soil contains less clay. Some areas do not have overwash. In some places the overwash has strata of loamy sand or sand. In other places the water table is at a depth of 2 to 4 feet in the spring. In a few areas the buried soil contains more sand. In a few other areas the buried soil is calcareous.

Included with this soil in mapping are small areas of the well drained Huntsville soils. These soils are in the higher areas on the flood plain. Also included are a few small areas, in the slightly higher positions and farther from stream channels than the Sawmill soil, that are only rarely flooded. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Sawmill soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The content of organic matter is moderate. The water table is at the surface to 2 feet below the surface during the spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding and the seasonal high water table. It is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas were flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, the seasonal high water table, low strength, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

8125—Selma loam, occasionally flooded. This nearly level, poorly drained soil is in broad depressions on outwash plains. It is subject to ponding and occasional flooding for brief periods from February through May. Individual areas are irregular in shape and range from 5 to 600 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is friable loam about 13 inches thick. The upper part is black, and the lower part is very dark gray and is mottled. The subsoil is friable loam about 23 inches thick. It is mottled. The upper part is dark gray, the next part is gray, and the lower part is light olive gray and dark gray. The substratum extends to a depth of 60 inches or more. It is mottled and very friable. It is stratified light brownish gray loamy sand and sandy loam and pale olive loam. In some places the seasonal high water table is at a depth of more than 2 feet. In other places the soil contains more sand. In some areas the dark surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas in the slightly higher positions that are not subject to flooding. These areas make up 2 to 5 percent of the unit.

Water and air move through the upper part of the Selma soil at a moderate rate and through the substratum at a moderately rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the ponding, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

8153—Pella silty clay loam, occasionally flooded. This nearly level, poorly drained soil is in depressions on outwash plains. It is subject to ponding and occasional flooding for brief periods from February through May. Individual areas are irregular in shape and range from 20 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer also is black, friable silty clay loam. It is about 5 inches thick. The subsoil is about 36 inches thick. The upper part is dark gray and gray, mottled, friable silty clay loam. The next part is gray, mottled, calcareous, firm silty clay loam. The lower part is mottled light olive brown, grayish brown, and olive, calcareous, friable silty clay loam. The substratum extends to a depth of 60 inches or more. It is mottled and calcareous. It is stratified yellowish brown, loose loamy sand and olive gray, friable silty clay loam. In some places the substratum is not stratified and is silty clay loam throughout. In other places the dark surface soil is more than 24 inches thick. In a few areas the soil contains less clay. In some places the soil is not calcareous within a depth of 40 inches. In a few areas the seasonal high water table is at a depth of more than 2 feet.

Included with this soil in mapping are small areas in the slightly higher positions that are not subject to flooding. These areas make up 2 to 5 percent of the unit.

Water and air move through the upper part of the Pella soil at a moderate rate and through the substratum at a moderately rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 2.0 feet below the surface during the spring. Available water capacity is high. The content of organic matter also is high. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Subsurface drains and surface ditches help to remove excess water where suitable outlets are available. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur. Applying a system of conservation tillage that includes ridge planting and leaving crop residue on the surface after planting improve tilth and seedling germination, increase the rate of water infiltration, and minimize crusting.

If this soil is used as a site for local roads and streets, low strength, the ponding, and the flooding are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

8201—Gilford loam, occasionally flooded. This nearly level, very poorly drained soil is on outwash plains and flood plains. It is subject to ponding and occasional flooding for brief periods from February through May. Individual areas are irregular in shape and range from 10 to 300 acres in size.

Typically, the surface layer is black, friable loam about 10 inches thick. Below this is about 9 inches of black, mottled, friable loam that has thin strata of clay loam and sandy loam. The substratum extends to a depth of 60 inches or more. The upper part is grayish brown, mottled, very friable loamy sand that has thin strata of loam and sandy loam. The next part is pale brown, mottled, loose fine sand that has thin strata of sandy loam. The lower part is pale brown, mottled, loose sand. In some places the dark surface soil is more than 24 inches thick. In other places the soil contains more clay. In some areas the soil contains more sand in the upper part.

Figure 14.—Residential development in an area of Tama silt loam, 2 to 5 percent slopes, which is prime farmland.

Water and air move through the upper part of the Gilford soil at a moderately rapid rate and through the lower part at a rapid rate. Surface runoff is very slow or ponded. The water table is 0.5 foot above to 1.0 foot below the surface during the spring. Available water capacity is moderate. The content of organic matter also is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is poorly suited to local roads and streets. It is generally unsuited to dwellings and septic tank absorption fields because of the flooding, a poor filtering capacity, and the ponding.

If drained, this soil can be used for corn, soybeans, or small grain. A drainage system has been installed in most areas. Measures that maintain or improve the drainage system are needed. Surface ditches and subsurface drains function satisfactorily if suitable outlets are available. Subsurface drainage tile should be enclosed by filter or envelope material to prevent the accumulation of sand in the tile. Droughtiness is a limitation in midsummer. A system of conservation tillage that leaves crop residue on the surface after planting improves seedling germination, minimizes crusting, helps to maintain tilth, and conserves moisture. Flooding normally does not affect crops during the growing season, but it may delay planting in some years. Constructing levees or strengthening existing levees helps to protect the soil in areas where flooding does occur.

If this soil is used as a site for local roads and streets, the ponding, the flooding, and the potential for frost action are management concerns. Strengthening or replacing the base material and building the roads at a level above the flood plain help to prevent damage. Open ditches can be used to remove excess water.

The land capability classification is IIw.

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 meeting 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 cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland 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 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 302,860 acres in Whiteside County, or nearly 68 percent of the total acreage, meets the requirements for prime farmland. Most of the prime farmland is in general soil map units 1, 3, 4, 5, 7, 8, and 9, which are described under the heading "General Soil Map Units."

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. 14). 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.

The map units in Whiteside County that are considered prime farmland are listed in table 5. 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 soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures. In Whiteside County most of the naturally wet soils have been adequately drained.

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 to prevent 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 behavioral 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 recreational 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

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 the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1982, about 398,294 acres in Whiteside County was farmland. Of this acreage, 20,711 acres was used for pasture, 345,340 acres was used for crops, and 11,165 acres was used as woodland. The remaining acreage was built-up areas or roads or was used for other purposes *(14)*. An increasing acreage of woodland and pasture has been planted to row crops in the past years.

The potential for continued crop production in Whiteside County is good, especially if the latest crop production and soil maintenance technologies are applied. This soil survey can assist in the application of such technology. It can also help planners to make informed decisions for the orderly growth and development of rural and urban areas.

Erosion is the major management concern on about 44 percent of the cropland and pasture in Whiteside County. About 20 percent of this acreage is adequately treated to keep erosion to tolerable levels. Water erosion is a hazard on soils that have slopes of more than 2 percent. It is more severe on the steeper soils on longer slopes.

Loss of the surface layer by sheet or rill erosion is damaging for several reasons. Productivity of most soils is reduced as the nutrient-rich organic matter and fine mineral particles are washed downslope. Loss of the surface layer is particularly damaging on soils that have layers that restrict the penetration of roots, such as Whalan and Woodbine soils. Erosion also reduces tilth in the surface layer. As tilth deteriorates, the likelihood that a crust will form after periods of rainfall increases. This crusting increases the runoff rate and decreases

Figure 15.—Grassed waterways remove excess water at a nonerosive velocity and help to prevent the formation of gullies.

the rate of water infiltration. The heavier textured soils tend to become cloddy as tilth deteriorates. Because of the cloddiness, preparing a good seedbed is difficult. Erosion on farmland results in the sedimentation of streams, rivers, lakes, and roadside ditches. Erosion control helps to prevent this pollution and improves the quality of water for municipal and recreational uses and for fish and wildlife.

A good management system helps to control erosion, maintains or improves natural fertility and tilth, removes excess water, and increases the rate of water infiltration. An adequate vegetative cover and measures that reduce the length of slopes help to control erosion and increase the rate of water infiltration. A crop rotation that includes grasses and legumes improves tilth and increases the supply of nitrogen.

Contour farming, contour stripcropping, and terraces reduce the length of slopes and increase the rate of water infiltration. A system of conservation tillage that leaves crop residue on the surface after planting, such as no-till farming or minimum tillage, reduces the runoff rate and minimizes soil loss. In the more sloping areas that have short slopes and irregular topography, a crop rotation that provides adequate plant cover is needed to keep soil loss at a tolerable level.

Grassed waterways help to carry excess rainwater safely downslope to the nearest creek, stream, or other watercourse (fig. 15). When established in natural drainageways, they remove the water at a nonerosive velocity. Grassed waterways generally are used in conjunction with other conservation practices, such as terraces, diversions, conservation tillage systems, and contour farming. They are most effective in areas where the slope is 2 percent or more.

Wind erosion is a management concern on about 14 percent of the cropland in the survey area, particularly in areas of Sparta, Plainfield, and Oakville soils. Field windbreaks, a system of conservation tillage that leaves crop residue on the surface, and an adequate plant cover help to control wind erosion.

Further information about measures that control erosion on specific soils is provided in the "Technical Guide," which is available in the local office of the Soil Conservation Service.

Wetness is a limitation in some areas. A drainage system has been installed in about 36 percent of the soils in the county. If the very poorly drained and poorly drained soils are used for the crops commonly grown in the county, some kind of drainage system is needed. Examples of these soils are Ambraw, Drummer, and Selma soils. The somewhat poorly drained soils, such as Elburn, Joy, and Muscatine soils, are wet enough in some years that a drainage system will permit more timely tillage and improve yields.

The design of surface and subsurface drainage systems varies with the kind of soil. Tile drains alone are inadequate in some areas. A combination of open drainage ditches and subsurface tile drains is needed in some areas of very poorly drained and poorly drained soils, such as Gilford and Selma soils. Tile drains are not effective in slowly permeable or very slowly permeable soils, such as Niota soils. Surface drains are needed on these soils. Moderately permeable and moderately slowly permeable soils, such as Elburn and Beaucoup soils, can be adequately drained by tile drains if suitable outlets are available.

Further information about the drainage system suitable for each kind of soil is provided in the "Technical Guide," which is available in the local office of the Soil Conservation Service.

Droughtiness limits the productivity of some of the soils used for crops and pasture in the county. The amount of available water is restricted by the physical composition of some soils. Sandy textured soils, such as Oakville, Plainfield, and Sparta soils, are examples. Soils that are stony, such as Lacrescent soils, also are subject to droughtiness.

Reducing the runoff rate and increasing the rate of water infiltration improve yields on droughty soils. No-till farming and crop residue management increase the rate of water infiltration and help to control runoff. Planting drought-tolerant species also improves productivity. Providing supplemental irrigation during dry periods can help to overcome droughtiness. In 1982, approximately 13,000 acres of farmland was irrigated in Whiteside County *(14)*.

Natural fertility in the soils of Whiteside County ranges from low to high. Reaction is slightly acid or neutral in most of the soils, but it ranges from very strongly acid to moderately alkaline. On most acid soils, proper applications of agricultural lime are needed to raise the pH level sufficiently for optimum crop production.

Many crops, including corn, remove large amounts of nitrogen from the soil when they are harvested. Erosion, denitrification, and leaching also remove nitrogen. Many crops, such as corn and wheat, respond well to applications of nitrogen fertilizer. Adding livestock waste and planting legumes, which fix atmospheric nitrogen, also help to replenish the supply of nitrogen in the soil.

Some soils, such as Canisteo and Prophetstown soils, have a high lime content, which affects the availability of some nutrients and the response to applications of herbicide. Applications of fertilizer should be adjusted to correct the nutrient imbalances. Applications of herbicides should also be adjusted as the level of alkalinity increases.

On all soils the kinds and amounts of lime and fertilizer should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kinds and amounts needed.

Soil tilth is an important factor affecting the germination of seeds, the runoff rate, and the rate of water infiltration. Soils that are granular and porous have good tilth.

Most of the soils used for crops in the survey area have enough organic matter in the surface soil to maintain good tilth. Severely eroded soils on side slopes, however, such as Timula and Seaton soils, have a low content of organic matter. Generally, the structure of such soils is weak, and a crust forms on the surface after periods of intense rainfall. The crust is hard when dry and is nearly impervious. It decreases the infiltration rate and increases the runoff rate. Planting grasses and legumes and regularly adding crop residue, manure, and other organic material to the soil improve soil structure and reduce the likelihood of crusting. Also, the response of the soils to applications of herbicide is affected by a low content of organic matter.

Poor tilth is a problem in the poorly drained soils that have a surface layer of silty clay loam, such as Beaucoup, Sawmill, and Titus soils. Clods form if these soils are plowed or tilled when wet. As a result of the cloddiness, preparing a good seedbed is difficult. If the soils are tilled in the fall, enough crop residue should be left on the surface to prevent excessive wind erosion. A system of conservation tillage that includes ridge planting reduces the number of trips over a field, reduces the degree of compaction, improves soil tilth, and provides a raised seedbed for spring planting in wet soils. The ridge formed during the previous year's cultivation dries out and warms up earlier in the spring.

The main field crops grown in the survey area are corn and soybeans. Small grain and forage also are grown. Producing small grain and forage crops more extensively would help to control erosion and improve natural soil fertility on much of the cropland.

Measures that help to control erosion, improve fertility, and prevent overgrazing are needed in the areas used for pasture. Applications of lime and fertilizer should be based on the results of soil tests. Annual applications of fertilizer help to keep the pasture productive and maintain a dense stand of grasses and legumes.

Pastures should not be grazed when the soils are wet. Rotation grazing, proper stocking rates, and measures that prevent overgrazing help to keep the stand productive. Seeding and maintaining adapted forage species in the stand of grasses improve the quality and productivity of the pasture.

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 6. 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 land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents *(6)*. 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 ensures 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 6 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 for those crops.

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 *(11)*. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include 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 or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. 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 few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants 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 hazard is the 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, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Ralph Eads, district forester, Illinois Department of Conservation, helped prepare this section.

Most of the woodland in the survey area is in the western half of the county. Tracts of woodland in the eastern half occur in scattered, small areas and are primarily used as a source of firewood or as homesites. Some of the woodland in the western part of the county has been cleared and is farmed. A large part of this land is not suited to farming. Erosion is a management concern in many of the cleared areas.

Many of the soils in Whiteside County are sandy. Because of past farming practices that allowed wind erosion to occur, coniferous trees were planted as field windbreaks (fig. 16). Most of the wind erosion has been brought under control in these areas. In areas where shelterbelts have been removed to allow the use of larger farm equipment, erosion is again a concern.

Much of the woodland in the county supports trees that are desirable for forest production. Desirable trees on the flood plains include cottonwood, silver maple, green ash, elm, river birch, walnut, and pin oak. In the uplands white oak, red oak, black oak, bur oak, bitternut hickory, basswood, elm, black cherry, and walnut are among the desired species.

About 18,200 acres, or about 4 percent of the acreage in the county, is woodland *(14)*. About 7,000 acres should be planted to trees. Most of this acreage is in land capability classes VI and VII.

About 10 percent of the woodland acreage is receiving proper timber management. The major concerns in managing timber are livestock grazing and improper harvesting techniques. Allowing livestock to graze the woodland results in gradual destruction of the stands. If properly managed, a well stocked stand of timber in Whiteside County is capable of producing over 300 board feet per acre per year. Stands of timber can be improved by removing poorly formed trees and undesirable species and thinning in areas where stand density is too high for optimum growth. Using proper harvesting techniques, excluding livestock from the woodland, and improving the stands are the main objectives for managing the woodland resource in Whiteside County.

Table 7 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 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 an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the

Figure 16.—This field windbreak in an area of the Sparta-Dickinson-Plainfield general soil map unit helps to control wind erosion and provides cover for wildlife.

surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site 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.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for 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, help to keep snow on 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 ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 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 commercial nursery.

Recreation

The soils of the survey area are rated in table 9 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 sewer lines. 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 recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, 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 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table

12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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 depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding 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 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

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 10, 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 flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

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, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, 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 flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

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, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, 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 depth to bedrock, 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. Wildlife attracted to these areas include bobwhite quail, 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 wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

The map units described in the section "General Soil Map Units" can be grouped into three wildlife areas. These areas are described in the following paragraphs.

Wildlife area 1 consists of the Tama-Downs-Port Byron, Richwood-Elburn-Drummer, Marshan-Prophetstown-Drummer, Ambraw-Zumbro-Du Page, and Selma general soil map units. The major soils in these map units are nearly level to moderately sloping and are very poorly drained, poorly drained, somewhat poorly drained, or well drained. The soils in the Ambraw-Zumbro-Du Page and Selma general soil map units are subject to flooding.

This area is used mainly as cropland. On much of the cropland, corn and soybeans are grown year after year. Many of the soils are plowed in the fall. The chief wildlife species are ring-necked pheasant, bobwhite quail, raccoon, cottontail rabbit, and a few white-tailed deer and coyotes and other openland nongame species. Also, muskrat, beaver, mink, and ducks inhabit the areas along creeks or drainage ditches. The potential for wildlife habitat is generally relatively poor because of a scarcity of crop residue, herbaceous nesting and roosting cover, woody cover, travel lanes, and hedgerows. The habitat can be improved by delaying mowing of grassy cover on roadsides, ditchbanks, and waterways until after the nesting season; protecting the woody cover; and leaving crop residue on the surface.

Wildlife area 2 consists of the Seaton-Downs-Fayette general soil map unit. The major soils in this map unit are gently sloping to steep and are well drained or moderately well drained.

This area is used mainly as cropland, pasture, or woodland. The potential for wildlife habitat is good because of some diversity of land types, which favors a variety of wildlife. The chief wildlife species are white-tailed deer, raccoon, squirrel, cottontail rabbit, ring-necked pheasant, mourning dove, and a few gray foxes and coyotes and other woodland nongame species. The habitat can be improved by properly managing pastured areas, excluding livestock from the wooded areas, leaving crop residue on the surface, and delaying mowing of grassy cover until after the nesting season.

Wildlife area 3 consists of the Waukegan-Tell-Lamont, Sparta-Dickinson-Plainfield, and Dickinson-Lawler general soil map units. The major soils in these map units are nearly level to steep and are somewhat poorly drained, well drained, somewhat excessively drained, and excessively drained.

This area is used as cropland, pasture, or woodland. The habitat favors a variety of wildlife. The chief wildlife species are squirrel, cottontail rabbit, white-tailed deer, mourning dove, bobwhite quail, ring-necked pheasant, and other nongame species. Droughtiness may reduce the quality of the habitat. Properly managing the pastured areas, excluding livestock from the woodlands, leaving crop residue on the surface, and delaying mowing of grassy cover until after the nesting season improve the habitat.

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. Ratings are given for 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 should 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 or 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 kinds 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 evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and 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 11 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 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, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 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 12 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 12 also shows the suitability of the soils for use as daily cover for landfill. 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 12 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 resulting from rapid permeability in 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 should be considered.

The ratings in table 12 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 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 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 wind erosion.

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 13 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 to 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, a 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 a 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 have a water table at a depth of 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. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, 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 high 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 14 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 in 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 the potential for 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 control 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 wind erosion 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 wind erosion, 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 18.

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 to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, 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 15 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 the heading "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 about 15 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 *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

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, CL-ML.

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. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

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.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 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 content of clay in 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, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving 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 ⅓-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 and septic tank absorption fields.

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 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 wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, 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 coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous 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 wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, 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 in 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 17 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 infiltration 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.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

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 is not considered flooding, nor is water in swamps and marshes.

Table 17 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, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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 little or no horizon development.

Also considered are 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 estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched 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 17.

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. 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.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

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 the 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 hazard of corrosion. 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 18 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 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); and Moisture density—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 *(12)*. 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. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven 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 has 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. Generally, 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 substratum 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" *(13)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(12)*. 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."

Ade Series

The Ade series consists of deep, somewhat excessively drained, rapidly permeable soils on stream terraces. These soils formed in wind- and water-deposited sandy material. Slopes range from 1 to 4 percent.

Ade soils are similar to and commonly are adjacent to Dickinson and Sparta soils. Dickinson and Sparta soils are in positions on terraces similar to those of the Ade soils. Dickinson soils contain more silt and clay in the upper part of the solum than the Ade soils. Sparta soils contain less silt and clay in the lower part of the subsoil than the Ade soils.

Typical pedon of Ade loamy fine sand, 1 to 4 percent slopes, 1,820 feet east and 105 feet north of the southwest corner of sec. 15, T. 20 N., R. 4 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

BA—10 to 16 inches; brown (10YR 4/3) loamy fine sand; weak medium subangular blocky structure parting to weak medium granular; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

Bw—16 to 27 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

E&Bt1—27 to 41 inches; dark yellowish brown (10YR 4/4) fine sand (E); single grain; loose; lamellae of brown (7.5YR 4/4) loam (Bt), about 6 inches apart and 4 to 5 inches thick; moderate medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

E&Bt2—41 to 60 inches; yellowish brown (10YR 5/4) fine sand (E); single grain; loose; lamellae of brown (7.5YR 4/4) sandy loam and loamy sand (Bt), about 5 inches apart and 1 to 3 inches thick; weak medium subangular blocky structure; friable; slightly acid.

The E part of the E&Bt horizon has hue of 10YR and chroma of 3 to 6. It is loamy fine sand or fine sand. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is loamy fine sand, fine sandy loam, sandy loam, or loam that averages less than 15 percent clay.

Adrian Series

The Adrian series consists of deep, very poorly drained soils on outwash plains and flood plains. These soils formed in herbaceous organic deposits over sandy sediments. Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying sandy material. Slopes range from 0 to 2 percent.

Adrian soils are similar to Houghton and Muskego soils and are commonly adjacent to Gilford, Marshan, and Muskego soils. Gilford, Marshan, and Muskego soils are on outwash plains. Houghton soils are on flood plains. Gilford soils formed entirely in sandy material. Houghton soils have organic deposits extending to a depth of more than 51 inches. Marshan soils formed in loamy material over sandy material. Muskego soils formed in organic deposits over coprogenous earth.

Typical pedon of Adrian muck, 2,080 feet west and 1,200 feet south of the northeast corner of sec. 35, T. 19 N., R. 4 E.

Oap—0 to 10 inches; sapric material, black (N 2/0) broken face and rubbed; less than 5 percent fiber, less than 2 percent rubbed; weak fine subangular blocky structure parting to weak fine granular; friable; strongly acid; abrupt smooth boundary.

Oa—10 to 22 inches; sapric material, black (N 2/0) broken face, black (5YR 2.5/1) rubbed; about 15 percent fiber, less than 5 percent rubbed; massive; friable; strongly acid; abrupt smooth boundary.

C—22 to 60 inches; pale brown (10YR 6/3) and brown (10YR 5/3) sand; few fine faint light brownish gray (10YR 6/2), few medium faint yellowish brown (10YR 5/4), and few medium prominent yellowish brown (7.5YR 5/6) mottles; single grain; loose; thin strata of dark grayish brown (10YR 4/2) sandy loam between depths of 22 and 28 inches; few fine pebbles; neutral.

Depth to the sandy horizon ranges from 16 to 50 inches.

Reaction ranges from strongly acid to neutral in the Oa horizon. The organic layer immediately above the sandy C horizon commonly has a comparatively high mineral content, ranging to as much as 50 percent in some pedons. The C horizon is sand or loamy sand. It ranges from slightly acid to moderately alkaline and contains free carbonates in some pedons.

Ambraw Series

The Ambraw series consists of deep, poorly drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Ambraw soils are similar to Beaucoup soils and are commonly adjacent to Zumbro, Medway, and Riley soils. Beaucoup soils contain less sand in the solum than the Ambraw soils. Also, they are in landscape positions similar to those of the Ambraw soils. Zumbro soils are well drained and are in the higher positions. They formed in sandy and loamy alluvium. Medway soils are moderately well drained and are in the higher positions. Riley soils are somewhat poorly drained and are in the slightly higher positions. They contain more sand within a depth of 40 inches than the Ambraw soils.

Typical pedon of Ambraw clay loam, rarely flooded, 2,400 feet north and 160 feet east of the southwest corner of sec. 11, T. 19 N., R. 3 E.

Ap—0 to 10 inches; black (10YR 2/1) clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A—10 to 20 inches; very dark gray (10YR 3/1) clay loam, dark grayish brown (10YR 4/2) dry; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; many faint black (10YR 2/1) organic films on faces of peds; neutral; clear smooth boundary.

Bg1—20 to 27 inches; dark gray (10YR 4/1) clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium and fine subangular blocky structure; friable; many faint very dark gray (10YR 3/1) organic films on faces of peds; few fine iron concretions; neutral; clear smooth boundary.

Bg2—27 to 32 inches; dark gray (10YR 4/1) clay loam; many medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; friable; few fine iron concretions; slightly acid; abrupt smooth boundary.

Bg3—32 to 36 inches; grayish brown (2.5Y 5/2) clay loam; many medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; friable; very dark gray (10YR 3/1) clay loam krotovinas 1 inch wide at a depth of 34 inches; few fine iron concretions; neutral; abrupt smooth boundary.

Bg4—36 to 45 inches; grayish brown (2.5Y 5/2) clay loam stratified with thin lenses of gray (10YR 5/1) sandy clay loam; few fine prominent brown (7.5YR 5/4) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine iron stains; slightly acid; gradual smooth boundary.

Cg—45 to 60 inches; stratified grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) sandy clay loam, and brown (10YR 5/3) loamy sand; few fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The mollic epipedon is 10 to 24 inches thick. In some pedons free carbonates are below a depth of 50 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 Bg horizon is mottled clay loam or sandy clay loam. It is stratified in the lower part. The Cg horizon has colors similar to those of the Bg horizon. It is stratified loamy sand to silty clay loam.

Ashdale Series

The Ashdale series consists of deep, well drained soils on uplands. These soils formed in loess and in material weathered from limestone bedrock. Permeability is moderate in the upper part of the solum and slow in the lower part. Slopes range from 2 to 7 percent.

Ashdale soils are similar to Ogle soils and are commonly adjacent to Dickinson, Ogle, and Waukegan soils. Dickinson, Ogle, and Waukegan soils do not have a layer of residuum over a lithic contact. Dickinson soils contain more sand in the control section and substratum than the Ashdale soils. Also, they are in the slightly higher positions. Ogle and Waukegan soils are in landscape positions similar to those of the Ashdale soils. Ogle soils have a reddish Late Sangamon paleosol within a depth of 50 inches. Waukegan soils contain more sand in the lower part of the control section and in the substratum than the Ashdale soils.

Typical pedon of Ashdale silt loam, 2 to 7 percent slopes, 1,480 feet north and 2,580 feet west of the southeast corner of sec. 12, T. 22 N., R. 4 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; medium acid; abrupt smooth boundary.

A—7 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; medium acid; clear smooth boundary.

BA—11 to 17 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; medium acid; clear smooth boundary.

Bt1—17 to 24 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few faint dark brown (10YR 3/3) organic films on faces of peds; few distinct very pale brown (10YR 7/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—24 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few distinct very pale brown (10YR 7/3) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—39 to 42 inches; strong brown (7.5YR 5/6) clay loam; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; common distinct brown (7.5YR 4/4) clay films on faces of peds; few fine manganese stains; few chert pebbles and quartzite pebbles; medium acid; clear smooth boundary.

3Bt4—42 to 57 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; firm; few distinct reddish brown (5YR 4/4) clay films on faces of peds; common pockets of loamy sand lining faces of peds; medium acid; clear irregular boundary.

3R—57 inches; hard, fractured limestone bedrock; yellow (10YR 7/8), soft, calcareous, weathered limestone in the upper 2 inches.

The thickness of the solum and the depth to limestone bedrock range from 40 to 60 inches. The thickness of the loess ranges from 36 to 50 inches. The dark surface layer ranges from 10 to 20 inches in thickness. The thickness of the residuum ranges from 2 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is silty clay or clay. It has 5 to 15 percent chert fragments in some pedons.

Atterberry Series

The Atterberry series consists of deep, somewhat poorly drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Atterberry soils are similar to Downs, Muscatine, and Rozetta soils and are commonly adjacent to Downs, Fayette, and Rozetta soils. Downs, Rozetta, and Fayette soils are in the more sloping or the slightly higher positions. Downs and Rozetta soils are moderately well drained, and Fayette soils are well drained. Fayette and Rozetta soils have a lighter colored surface layer than the Atterberry soils. Muscatine soils have a thicker dark surface soil than the Atterberry soils. They are in landscape positions similar to those of the Atterberry soils.

Typical pedon of Atterberry silt loam, 440 feet south and 1,260 feet west of the northeast corner of sec. 2, T. 22 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; neutral; abrupt smooth boundary.

E—8 to 17 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium platy structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; few fine iron stains; slightly acid; clear smooth boundary.

BE—17 to 23 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; weak thick platy structure parting to moderate fine subangular blocky; friable; few faint brown (10YR 4/3) fillings in root channels; few faint grayish brown (10YR 5/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt1—23 to 29 inches; brown (10YR 5/3) silty clay loam; grayish brown (10YR 5/2) faces of peds; common fine distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; moderate medium and fine subangular blocky structure; friable; common faint grayish brown (10YR 5/2) clay films on faces of peds; few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt2—29 to 35 inches; pale brown (10YR 6/3) silty clay loam; grayish brown (10YR 5/2) faces of peds; common medium faint light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common faint grayish brown (10YR 5/2) clay films on faces of peds; few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt3—35 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; dark grayish brown (10YR 4/2) faces of peds; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; friable; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine concretions of iron and manganese oxide; medium acid; clear smooth boundary.

BC—40 to 47 inches; yellowish brown (10YR 5/4) silt loam; grayish brown (10YR 5/2) faces of peds; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few distinct grayish brown (10YR 5/2) and few faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine concretions of iron and manganese oxide; medium acid; clear smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/4) silt loam; light brownish gray (2.5Y 6/2) faces of peds; few fine prominent light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine concretions of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 42 to 55 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Bt horizon has hue of 2.5Y, value of 4 to 6, and chroma of 2 to 4. Some pedons that have matrix chroma of 3 or 4 contain mottles with chroma of 1 or 2.

Beaucoup Series

The Beaucoup series consists of deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Beaucoup soils are similar to Ambraw, Sawmill, and Titus soils and are commonly adjacent to Ambraw and Titus soils. Ambraw, Sawmill, and Titus soils are in landscape positions similar to those of the Beaucoup soils. Ambraw soils contain more sand throughout than the Beaucoup soils. Sawmill soils have a mollic epipedon that is more than 24 inches thick. Titus soils contain more clay in the solum than the Beaucoup soils.

Typical pedon of Beaucoup silty clay loam, rarely flooded, 1,540 feet north and 1,860 feet east of the southwest corner of sec. 26, T. 20 N., R. 4 E.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

AB—10 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

Bg1—16 to 24 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium and fine subangular blocky structure; friable; common faint very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg2—24 to 33 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bg3—33 to 43 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; neutral; clear smooth boundary.

BCg—43 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam; few fine prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; friable; very dark gray (10YR 3/1) krotovinas 2 inches wide at a depth of 46 inches; mildly alkaline; gradual smooth boundary.

Cg—50 to 60 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) silt loam; common medium and fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; mildly alkaline.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The Ap horizon is neutral in hue and has value of 2 or 3 and chroma of 0 to 2. The Bg horizon has hue of 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. The BCg and Cg horizons are silty clay loam or silt loam. In some pedons they have thin strata of loam, sandy loam, fine sandy loam, or very fine sandy loam.

Bertrand Series

The Bertrand series consists of deep, well drained soils on outwash plains and stream terraces. These soils formed in loess and in loamy, stratified sediments. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 2 to 10 percent.

Bertrand soils are similar to Seaton and Richwood soils and are commonly adjacent to Richwood and Virgil soils. Seaton soils formed entirely in loess and are on uplands. Richwood soils have a mollic epipedon. They are in landscape positions similar to those of the Bertrand soils. Virgil soils have a thin dark surface layer. They are somewhat poorly drained and are in the less sloping or the slightly lower positions.

Typical pedon of Bertrand silt loam, 2 to 5 percent slopes, 1,540 feet west and 2,280 feet south of the northeast corner of sec. 17, T. 21 N., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

E—9 to 12 inches; brown (10YR 4/3) silt loam; weak medium platy structure; friable; slightly acid; clear smooth boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt2—17 to 25 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; many faint brown (10YR 4/3) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt3—25 to 33 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine manganese stains; strongly acid; clear smooth boundary.

Bt4—33 to 40 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; many sand grains visible on faces of peds; few fine manganese stains; strongly acid; clear smooth boundary.

2Bt5—40 to 60 inches; yellowish brown (10YR 5/4) silt loam that has thin strata of loam and sandy loam; few fine faint pale brown (10YR 6/3) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine manganese stains; strongly acid.

The thickness of the solum ranges from 55 to 65 inches. Depth to the loamy stratified sediments ranges from 40 to 55 inches.

The E horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It ranges from neutral to strongly acid. The 2Bt or 2BC horizon, if it occurs, is stratified silt loam, loam, fine sandy loam, sandy loam, or loamy fine sand. In some pedons it has thin strata of loamy sand or sand. It ranges from slightly acid to strongly acid.

Birds Series

The Birds series consists of deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Birds soils are similar to Otter soils and are commonly adjacent to Zumbro soils. Otter soils have a thick mollic epipedon. They are in landscape positions similar to those of the Birds soils. Zumbro soils are well drained and are higher on the flood plains than the Birds soils. They have a mollic epipedon and contain more sand in the solum and substratum than the Birds soils.

Typical pedon of Birds silt loam, wet, 1,720 feet south and 540 feet west of the northeast corner of sec. 5, T. 21 N., R. 3 E.

Cg1—0 to 19 inches; stratified dark grayish brown and grayish brown (10YR 3/2) silt loam, light gray (10YR 7/2) dry; few fine prominent yellowish red (7.5YR 4/6) mottles; massive; friable; few distinct very dark gray (10YR 3/1) organic films lining root channels; common thin strata of very fine sandy loam; mildly alkaline; abrupt smooth boundary.

Cg2—19 to 39 inches; olive gray (5Y 4/2) and dark gray (5Y 4/1) silt loam; few fine prominent yellowish red (7.5YR 4/6) mottles; massive; friable; few distinct very dark gray (10YR 3/1) organic films lining root channels; few thin strata of grayish brown (10YR 5/2) very fine sandy loam; mildly alkaline; clear smooth boundary.

Cg3—39 to 60 inches; dark gray (5Y 4/1) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; few thin strata of grayish brown (10YR 5/2) very fine sandy loam; mildly alkaline.

Some pedons have value of 3 in the thin strata or in buried horizons below a depth of 40 inches.

Birkbeck Series

The Birkbeck series consists of deep, moderately well drained soils on uplands. These soils formed in loess and in the underlying glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 5 to 10 percent.

Birkbeck soils are similar to Downs, Fayette, and Rozetta soils and are commonly adjacent to Downs and Fayette soils. Downs, Fayette, and Rozetta soils formed entirely in loess. Fayette and Rozetta soils are in landscape positions similar to those of the Birkbeck soils. Downs soils are on ridges above the Birkbeck soils. Fayette soils are well drained.

Typical pedon of Birkbeck silt loam, 5 to 10 percent slopes, eroded, 200 feet west and 180 feet south of the northeast corner of sec. 28, T. 22 N., R. 7 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate very fine granular structure; friable; few brown (10YR 5/3) fragments of subsoil material; neutral; abrupt smooth boundary.

Bt1—7 to 15 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; common faint brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—15 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—24 to 35 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt4—35 to 45 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; neutral; abrupt smooth boundary.

2Bt5—45 to 51 inches; yellowish brown (10YR 5/4) clay loam; common medium and coarse distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) and common faint brown (10YR 4/3) clay films on faces of peds; few pebbles; neutral; abrupt smooth boundary.

2Bt6—51 to 60 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few faint dark brown (10YR 3/3) organic films in root channels; few pebbles; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to 65 inches. The thickness of the loess ranges from 40 to 60 inches.

The Ap horizon has chroma of 4 or 5 and value of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. The 2Bt horizon is clay loam, silty clay loam, or loam.

Blackoar Series

The Blackoar series consists of deep, poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Blackoar soils are similar to Ambraw, Otter, and Sawmill soils and are commonly adjacent to Ambraw and Sawmill soils. Ambraw, Otter, and Sawmill soils are in landscape positions similar to those of the Blackoar soils. Ambraw soils contain more sand throughout the solum than the Blackoar soils. Otter and Sawmill soils have a mollic epipedon that is more than 24 inches thick. Sawmill soils contain more clay in the solum than the Blackoar soils.

Typical pedon of Blackoar silt loam, rarely flooded, 100 feet west and 1,960 feet north of the southeast corner of sec. 21, T. 20 N., R. 4 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

Bg1—13 to 23 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) and common fine prominent brown (7.5YR 4/4) mottles; moderate medium and fine subangular blocky structure; friable; common distinct very dark gray (10YR 3/1) organic films on faces of peds; very dark gray (10YR 3/1) krotovinas 1 inch wide at a depth of 22 inches; neutral; clear smooth boundary.

Bg2—23 to 37 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine and medium prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; common fine rounded concretions of iron and manganese oxide; neutral; clear smooth boundary.

BCg—37 to 58 inches; dark grayish brown (2.5Y 4/2) and dark gray (10YR 4/1) silt loam; common fine and medium prominent brown (7.5YR 4/4) mottles;

weak medium prismatic structure; friable; common fine rounded concretions of iron and manganese oxide; neutral; clear smooth boundary.

Cg—58 to 60 inches; dark gray (5Y 4/1) silt loam; few fine prominent brown (7.5YR 4/4) mottles; massive; friable; neutral.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bg, BCg, and Cg horizons are neutral in hue and have value of 4 to 6 and chroma of 0 to 2. In some pedons the Bg horizon has thin layers of silty clay loam.

Calco Series

The Calco series consists of deep, poorly drained, moderately permeable soils on flood plains. These soils formed in calcareous, silty alluvium. Slopes range from 0 to 2 percent.

Calco soils are similar to Millington soils and are commonly adjacent to Du Page and Zumbro soils. Du Page and Millington soils formed in loamy alluvium. Du Page soils are moderately well drained and are in the slightly higher positions. Millington soils are in landscape positions similar to those of the Calco soils. Zumbro soils formed in sandy and loamy alluvium and are noncalcareous. They are well drained and are in the higher positions.

Typical pedon of Calco silty clay loam, wet, 1,100 feet east and 2,600 feet south of the northwest corner of sec. 19, T. 19 N., R. 4 E.

A1—0 to 17 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; few snail-shell fragments; slight effervescence; mildly alkaline; gradual smooth boundary.

A2—17 to 30 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium and fine subangular blocky structure; friable; few snail-shell fragments; slight effervescence; mildly alkaline; gradual smooth boundary.

A3—30 to 37 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure; friable; few snail-shell fragments; violent effervescence; mildly alkaline; gradual smooth boundary.

Bg—37 to 49 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; friable; few snail-shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

Cg—49 to 60 inches; dark gray (5Y 4/1) loam; massive; friable; few thin lenses of sand; few snail-shell fragments; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 30 to 50 inches. The soils commonly contain fragments of snail shells throughout. Reaction is mildly alkaline or moderately alkaline.

The A or Ap horizon has hue of 2.5Y or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It typically is silty clay loam, but in some pedons it is silt loam in the upper part. The Bg and Cg horizons have hue of 2.5Y or are neutral in hue. They have value of 3 to 6 and chroma of 0 or 1. The Cg horizon is loam, clay loam, silt loam, or silty clay loam. In some pedons it is stratified loam, silt loam, sandy loam, or silty clay loam.

Canisteo Series

The Canisteo series consists of deep, poorly drained soils on outwash plains. These soils formed in calcareous, loamy sediments over sandy outwash. Permeability is moderate in the solum and rapid in the substratum. Slopes range from 0 to 2 percent.

Canisteo soils are similar to Prophetstown soils and are commonly adjacent to Lawler and Marshan soils. Prophetstown and Marshan soils are in landscape positions similar to those of the Canisteo soils. Prophetstown soils contain less sand in the solum than the Canisteo soils. Also, they do not have a sandy substratum. They have a calcic horizon. Marshan soils do not have carbonates in the control section. They contain more sand within a depth of 40 inches than the Canisteo soils. Lawler soils are somewhat poorly drained and are slightly higher on the landscape than the Canisteo soils. They are noncalcareous and contain more sand within a depth of 40 inches than the Canisteo soils.

Typical pedon of Canisteo loam, sandy substratum, 300 feet west and 860 feet north of the southeast corner of sec. 9, T. 19 N., R. 7 E.

Ap—0 to 9 inches; black (5Y 2/1) loam, dark gray (5Y 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

A1—9 to 18 inches; black (5Y 2/1) loam, dark gray (5Y 4/1) dry; weak medium and fine subangular blocky structure; friable; strong effervescence; mildly alkaline; gradual smooth boundary.

A2—18 to 23 inches; very dark gray (5Y 3/1) clay loam, dark gray (5Y 4/1) dry; weak medium and fine subangular blocky structure; friable; many faint black (10YR 2/1) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

Bg—23 to 29 inches; dark gray (5Y 4/1) clay loam; weak medium and fine subangular blocky structure; friable; many prominent very dark gray (10YR 3/1) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

Btg—29 to 36 inches; grayish brown (2.5Y 5/2) clay loam; common fine distinct light olive brown (2.5Y 5/6) and few fine faint light brownish gray (2.5Y 6/2) mottles; moderate medium and fine subangular blocky structure; friable; many distinct dark gray (10YR 4/1) clay films on faces of peds; slight effervescence; mildly alkaline; gradual smooth boundary.

BCg—36 to 49 inches; grayish brown (2.5Y 5/2) sandy loam; few fine prominent yellowish brown (10YR 5/8) and few fine distinct light olive brown (2.5Y 5/6) mottles; weak coarse and medium subangular blocky structure; very friable; light gray (5Y 6/1) band of silt loam 2 inches thick with few fine prominent olive yellow (2.5Y 6/6) mottles; mildly alkaline; abrupt smooth boundary.

2Cg—49 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; dark grayish brown (10YR 4/2) band of loamy sand 2 inches thick; mildly alkaline.

The thickness of the solum ranges from 40 to 50 inches. The thickness of the mollic epipedon ranges from 14 to 24 inches.

The A horizon has hue of 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is loam, silt loam, or clay loam. The Bg and Btg horizons are clay loam, loam, or silt loam. The BCg horizon is sandy loam or loam. It contains free carbonates in some pedons. The 2Cg horizon is sand or loamy sand.

Catlin Series

The Catlin series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and in the underlying glacial till. Slopes range from 1 to 10 percent.

Catlin soils are similar to Port Byron soils and are commonly adjacent to Drummer and Elburn soils. Drummer and Elburn soils formed in loess and in the underlying stratified outwash. Drummer soils are poorly drained and are in the lower, depressional positions. Elburn soils are somewhat poorly drained and are slightly lower on the landscape than the Catlin soils. Port Byron soils formed in loess. They are in landscape positions similar to those of the Catlin soils.

Typical pedon of Catlin silt loam, 1 to 5 percent slopes, 1,600 feet west and 2,460 feet south of the northeast corner of sec. 9, T. 21 N., R. 7 E.

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; slightly acid; abrupt smooth boundary.

A—7 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

BA—11 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; common distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

Bt1—15 to 21 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; many faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—21 to 31 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—31 to 43 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate coarse subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

2BC—43 to 51 inches; yellowish brown (10YR 5/4) clay loam; weak medium prismatic structure; friable; few faint brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; neutral; clear smooth boundary.

2C—51 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; few pebbles; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the loess ranges from 40 to 60 inches. The mollic epipedon ranges from 10 to 18 inches in thickness. Reaction ranges from strongly acid to neutral in the loess and from slightly acid to moderately alkaline in the glacial till.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. The 2BC and 2C horizons are loam or clay loam.

Catlin silt loam, 5 to 10 percent slopes, eroded, has a thinner dark surface soil than is definitive for the Catlin series. This difference, however, does not affect the use or behavior of the soil.

Coffeen Series

The Coffeen series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in silty alluvium. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Coffeen soils are similar to Lawson and Orion soils and are commonly adjacent to Lawson, Orion, and Sawmill soils. Lawson and Orion soils are in landscape positions similar to those of the Coffeen soils. Orion soils have an ochric epipedon and have a dark buried soil within a depth of 40 inches. Lawson and Sawmill soils contain more clay in the solum than the Coffeen soils and have a mollic epipedon that is more than 24 inches thick. Sawmill soils are poorly drained and are in the lower positions that are subject to ponding.

Typical pedon of Coffeen silt loam, frequently flooded, 860 feet north and 1,740 feet west of the southeast corner of sec. 24, T. 20 N., R. 3 E.

Ap—0 to 9 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.

A—9 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

Bw1—17 to 24 inches; brown (10YR 4/3) silt loam; common fine faint dark grayish brown (10YR 4/2) and common fine faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw2—24 to 33 inches; brown (10YR 4/3) silt loam; common fine faint grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; mildly alkaline; clear smooth boundary.

BCg—33 to 46 inches; grayish brown (2.5Y 5/2), stratified silt loam and loam; common fine prominent strong brown (7.5YR 4/6) and dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine concretions of iron and manganese oxide; mildly alkaline; gradual smooth boundary.

Cg—46 to 60 inches; mottled grayish brown (2.5Y 5/2) and brown (10YR 5/3) silt loam; massive; friable; few fine concretions of iron and manganese oxide; mildly alkaline.

The thickness of the solum ranges from 30 to 55 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. Some pedons have an AB horizon, which has colors similar to those of the Ap horizon. The Bw horizon has hue of 2.5Y, value of 4 to 6, and chroma of 2 or 3. It is silt loam or loam. It is fine sandy loam in individual subhorizons of some pedons. It ranges from medium acid to mildly alkaline. The Cg horizon has hue of 10YR or 5Y, value of 4 to 8, and chroma of 1 to 3. It is silt loam or stratified silt loam, loam, fine sandy loam, or sandy loam. It ranges from medium acid to mildly alkaline.

Craigmile Series

The Craigmile series consists of deep, very poorly drained soils on flood plains. These soils formed in loamy over sandy alluvium. Permeability is moderately rapid in the upper part of the profile and rapid in the underlying sandy material. Slopes range from 0 to 2 percent.

Craigmile soils are similar to Selma soils and are commonly adjacent to Sparta and Zumbro soils. Selma soils are poorly drained and are on flooded outwash plains. They contain more clay in the control section and in the substratum than the Craigmile soils. Sparta soils are excessively drained and are on terraces. They contain more sand in the solum than the Craigmile soils. Zumbro soils are well drained and are in the higher positions on the flood plains. They contain more sand in the upper part of the profile than the Craigmile soils.

Typical pedon of Craigmile sandy loam, wet, 2,300 feet south and 2,880 feet west of the northeast corner of sec. 11, T. 22 N., R. 3 E..

A1—0 to 4 inches; very dark gray (10YR 3/1) sandy loam, very dark grayish brown (10YR 3/2) dry; moderate fine and medium granular structure; friable; very strongly acid; clear smooth boundary.

A2—4 to 11 inches; very dark gray (10YR 3/1) sandy loam, dark grayish brown (10YR 4/2) dry; few fine prominent dark brown (7.5YR 3/4) mottles; moderate medium subangular blocky structure parting to moderate fine and medium granular; friable; strongly acid; clear smooth boundary.

A3—11 to 22 inches; very dark gray (10YR 3/1) sandy loam, dark grayish brown (10YR 4/2) dry; few fine distinct brown (10YR 4/3) mottles; weak coarse subangular blocky structure; friable; few concretions of iron and manganese oxide; medium acid; abrupt smooth boundary.

Cg1—22 to 38 inches; grayish brown (2.5Y 5/2) fine sandy loam; few fine prominent brown (7.5YR 4/4) mottles; massive; friable; few thin strata of sandy loam; few concretions of iron and manganese oxide; medium acid; abrupt smooth boundary.

Cg2—38 to 60 inches; stratified dark yellowish brown (10YR 4/4) and dark grayish brown (2.5Y 4/2) sand; few medium prominent reddish brown (5YR 4/4) mottles; single grain; loose; few thin strata of coarse sand; few concretions of iron and manganese oxide; slightly acid.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is sandy loam, fine sandy loam, or loam. The Cg horizon is fine sandy loam, loam, or silt loam in the upper part and loamy sand or sand in the lower part.

Denrock Series

The Denrock series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in silty material and in the underlying lacustrine and loamy sediments over sandy material. Permeability is very slow in the subsoil and rapid in the substratum. Slopes range from 0 to 2 percent.

Denrock soils are commonly adjacent to Joslin and Niota soils. Joslin soils are well drained and are in the slightly higher positions on terraces. They contain less clay in the upper part of the solum than the Denrock soils. Niota soils are poorly drained and are in the lower positions on terraces that are subject to ponding. They have a thinner dark surface layer than the Denrock soils.

Typical pedon of Denrock silt loam, 100 feet south and 740 feet west of the northeast corner of sec. 7, T. 19 N., R. 5 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak medium granular; friable; medium acid; abrupt smooth boundary.

A—7 to 13 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium subangular blocky structure parting to weak medium granular; friable; many distinct dark brown (7.5YR 3/2) organic films on faces of peds; medium acid; clear smooth boundary.

BA—13 to 18 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; few distinct dark brown (7.5YR 3/2) organic films on faces of peds; few distinct reddish brown (5YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt1—18 to 26 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; many faint reddish brown (5YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—26 to 36 inches; reddish brown (5YR 4/4) silty clay; few fine prominent brown (7.5YR 5/2) and red (2.5YR 4/6) mottles; moderate medium prismatic structure parting to strong medium angular blocky; firm; common faint reddish brown (5YR 4/3) clay films on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—36 to 40 inches; brown (10YR 5/3) loam; few fine distinct yellowish brown (10YR 5/6), few fine distinct strong brown (7.5YR 4/6), and few fine faint pale brown (10YR 6/3) mottles; moderate coarse angular blocky structure; friable; common distinct brown (7.5YR 4/4) clay films on faces of peds; slightly acid; abrupt smooth boundary.

3Bt4—40 to 48 inches; yellowish brown (10YR 5/6) sandy loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few prominent brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

3C—48 to 60 inches; strong brown (7.5YR 5/6) sand; few medium prominent yellowish brown (10YR 5/4) and few fine faint strong brown (7.5YR 5/8) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 36 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. The 2Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is silty clay loam, silty clay, or clay. It ranges from 38 to 60 percent clay. The 3Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 to 6. It commonly has mottles with chroma of 2 in the lower part. It is clay loam, loam, or sandy loam. The 3C horizon ranges from loam to sand.

Dickinson Series

The Dickinson series consists of deep, well drained soils that formed in wind- or water-deposited, loamy and sandy sediments on outwash plains and stream terraces. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 7 percent.

Dickinson soils are similar to Lamont and Sparta soils and are commonly adjacent to Lawler, Sparta, and Udolpho soils. Lamont and Sparta soils are in landscape positions similar to those of the Dickinson soils. Lamont soils are well drained. They have an ochric epipedon. Sparta soils are excessively drained. They contain more sand in the solum than the Dickinson soils. Lawler and Udolpho soils are in the slightly lower positions. They contain more clay in the solum than the Dickinson soils. Lawler soils are somewhat poorly drained, and Udolpho soils are poorly drained. Udolpho soils have a thinner dark surface soil than the Dickinson soils.

Typical pedon of Dickinson loam, 0 to 2 percent slopes, 2,440 feet west and 1,500 feet south of the northeast corner of sec. 35, T. 20 N., R. 7 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A1—7 to 14 inches; very dark brown (10YR 2/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; clear smooth boundary.

A2—14 to 20 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; strongly acid; clear smooth boundary.

Bw1—20 to 26 inches; brown (10YR 4/3) fine sandy loam; moderate medium and fine subangular blocky structure; friable; few faint dark brown (10YR 3/3) organic coatings on faces of peds; strongly acid; clear smooth boundary.

Bw2—26 to 31 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium and fine subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.

BC—31 to 36 inches; dark yellowish brown (10YR 4/6) loamy fine sand; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

C—36 to 60 inches; dark yellowish brown (10YR 4/6) fine sand; single grain; loose; few fine rounded accumulations of iron oxide; medium acid.

The thickness of the solum ranges from 25 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has chroma of 1 or 2. It is sandy loam, fine sandy loam, or loam. The Bw horizon has value of 4 or 5 and chroma of 3 to 6. It is fine sandy loam or sandy loam. It ranges from strongly acid to slightly acid. The BC and C horizons have value of 4 or 5 and chroma of 4 to 6. They are loamy sand, loamy fine sand, fine sand, or sand. The C horizon is medium acid or slightly acid.

Dickinson sandy loam, 2 to 7 percent slopes, eroded, has a thinner dark surface soil than is definitive for the Dickinson series. This difference, however, does not affect the use or behavior of the soil.

Downs Series

The Downs series consists of deep, well drained and moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 10 percent.

Downs soils are similar to and are commonly adjacent to Atterberry, Fayette, and Rozetta soils. Fayette soils are well drained. Fayette and Rozetta soils do not have a dark surface layer. They are in landscape positions similar to those of the Downs soils. Atterberry soils are somewhat poorly drained and are in the nearly level, slightly lower positions.

Typical pedon of Downs silt loam, 2 to 5 percent slopes, 1,320 feet east and 70 feet north of the southwest corner of sec. 9, T. 22 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium and thick platy structure parting to weak fine granular; very friable; slightly acid; abrupt smooth boundary.

BE—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak thin and medium platy structure parting to weak fine and medium subangular blocky; friable; many faint dark brown (10YR 3/3) organic films on faces of peds; slightly acid; clear smooth boundary.

Bt1—14 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—21 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium angular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

Bt3—28 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium angular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) and few faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

Bt4—36 to 44 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray

(10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; friable; many faint dark yellowish brown (10YR 4/4) and few faint brown (10YR 4/3) clay films on faces of peds; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

Bt5—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; friable; many faint dark yellowish brown (10YR 4/4) and few faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid.

The thickness of the solum ranges from 42 to more than 60 inches. The thickness of the dark surface layer ranges from 6 to 9 inches.

The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It ranges from strongly acid to neutral.

Drummer Series

The Drummer series consists of deep, poorly drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying loamy, stratified sediments. Slopes range from 0 to 2 percent.

Drummer soils are similar to Sable soils and are commonly adjacent to Elburn soils, Joy soils that have a sandy substratum, and Thorp soils. Elburn and Joy soils are somewhat poorly drained and are in the slightly higher positions. Joy soils contain more sand within a depth of 60 inches than the Drummer soils. Sable soils formed entirely in loess. They are on uplands. Thorp soils have a lighter colored subsurface layer than the Drummer soils. Also, they are slowly permeable in the upper part of the subsoil. They are in landscape positions similar to those of the Drummer soils.

Typical pedon of Drummer silt loam, 1,780 feet east and 960 feet south of the northwest corner of sec. 20, T. 21 N., R. 5 E.

Ap—0 to 9 inches; black (N 2/0) silt loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; mildly alkaline; abrupt smooth boundary.

A—9 to 17 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium and fine subangular blocky structure; friable; mildly alkaline; abrupt smooth boundary.

Bg1—17 to 22 inches; gray (5Y 5/1) silty clay loam; common fine prominent light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; few prominent black (N 2/0) organic coatings on faces of peds; few concretions of iron and manganese oxide; mildly alkaline; clear smooth boundary.

Bg2—22 to 29 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent light olive brown (2.5Y 5/6) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; few concretions of iron and manganese oxide; mildly alkaline; clear smooth boundary.

Bg3—29 to 40 inches; light olive gray (5Y 6/2) silt loam; many medium and fine prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure; friable; mildly alkaline; abrupt smooth boundary.

2BCg—40 to 48 inches; gray (5Y 6/1) silt loam; few fine prominent light olive brown (2.5Y 5/4) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; friable; black (N 2/0) krotovinas 1 inch wide at a depth of 47 inches; mildly alkaline; abrupt smooth boundary.

2Cg—48 to 60 inches; light olive gray (5Y 6/2), stratified loam and silt loam; few fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; few pebbles; few nodules of secondary calcium carbonate; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 42 to 55 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches. The thickness of the loess ranges from 40 to 60 inches. The depth to carbonates also ranges from 40 to 60 inches.

The A horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The 2BCg horizon is silt loam or loam. It is stratified in some pedons. The 2Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is stratified with textures ranging from silty clay loam to sandy loam.

Du Page Series

The Du Page series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in calcareous, loamy alluvium. Slopes range from 0 to 3 percent.

Du Page soils are commonly adjacent to Calco and Zumbro soils. Calco soils formed in silty alluvium. They are poorly drained and are in the lower positions that are subject to ponding. Zumbro soils are noncalcareous and formed in sandy and loamy alluvium. They are well drained and are in the higher positions on the flood plains.

Typical pedon of Du Page silt loam, frequently flooded, 0 to 3 percent slopes, 1,160 feet east and 1,820 feet south of the northwest corner of sec. 36, T. 20 N., R. 4 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure parting to weak medium granular; friable; few snail-shell fragments; strong effervescence; mildly alkaline; abrupt smooth boundary.

A1—9 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure parting to weak medium granular; friable; many faint very dark gray (10YR 3/1) organic coatings on faces of peds; few snail-shell fragments; strong effervescence; mildly alkaline; clear smooth boundary.

A2—17 to 27 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate medium and fine subangular blocky structure; friable; few faint very dark gray (10YR 3/1) organic coatings on faces of peds; few snail-shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

A3—27 to 34 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark gray (10YR 3/1) wormcasts; few snail-shell fragments; violent effervescence; moderately alkaline; clear smooth boundary.

C—34 to 60 inches; dark grayish brown (10YR 4/2) loam that has thin strata of brown (10YR 5/3) sandy loam; few fine distinct dark yellowish brown (10YR 4/4) mottles at a depth of 58 to 60 inches; massive; friable; few very dark grayish brown (10YR 3/2) wormcasts; few snail-shell fragments; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 50 inches. The thickness of the mollic epipedon ranges from 24 to 40 inches. The soils commonly contain fragments of snail shells throughout. Some pedons do not have carbonates in the upper 10 inches.

The upper part of the A horizon commonly is silt loam, but it is loam in some pedons. The lower part is loam, sandy loam, or sandy clay loam. Some pedons have a B horizon, which has value of 3 or 4 and chroma of 2 or 3. This horizon is loam or sandy loam. The C horizon has chroma of 1 to 4. It is stratified loam, sandy loam, or sandy clay loam.

Elburn Series

The Elburn series consists of deep, somewhat poorly drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy, stratified sediments. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Elburn soils are similar to Muscatine soils and are commonly adjacent to Catlin, Drummer, and Richwood soils. Muscatine soils formed entirely in loess. They are on uplands. Catlin and Richwood soils are well drained and are in the more sloping or slightly higher positions. Catlin soils have glacial till in the lower part of the solum and in the substratum. Drummer soils are poorly drained and are in the lower positions.

Typical pedon of Elburn silt loam, 2,360 feet north and 480 feet east of the southwest corner of sec. 2, T. 21 N., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to moderate medium granular; few brown (10YR 4/3) wormcast mixings; friable; many faint very dark gray (10YR 3/1) organic films on faces of peds; neutral; abrupt smooth boundary.

BA—16 to 22 inches; brown (10YR 4/3) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; moderate medium and fine subangular blocky structure; friable; few distinct very dark gray (10YR 3/1) organic films on faces of peds; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine concretions of iron oxide; slightly acid; clear smooth boundary.

Bt1—22 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium angular blocky; friable; common distinct grayish brown (10YR 5/2) and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine concretions of iron oxide; slightly acid; clear smooth boundary.

Bt2—32 to 39 inches; brown (10YR 5/3) silty clay loam; many fine distinct light brownish gray (2.5Y 6/2) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate fine prismatic structure; friable; few faint grayish brown (10YR 5/2) clay films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic fillings in root channels; few medium concretions of iron oxide; neutral; clear smooth boundary.

Bt3—39 to 46 inches; pale brown (10YR 6/3) silt loam; many fine distinct light brownish gray (2.5Y 6/2) and common medium prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; few faint grayish brown (10YR 5/2) clay films on faces of peds and in root channels; few distinct very dark grayish brown (10YR 3/2) organic fillings in root channels; few fine concretions of iron oxide; neutral; clear smooth boundary.

2BC—46 to 60 inches; pale brown (10YR 6/3), stratified silt loam and loam; many medium distinct light brownish gray (2.5Y 6/2) and many medium prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; few distinct very dark grayish brown (10YR 3/2) organic fillings in root channels; few fine concretions of iron oxide; neutral.

The thickness of the solum ranges from 50 to 65 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches. The thickness of the loess ranges from 40 to 60 inches.

The Bt horizon has value of 4 or 5 and chroma of 2 to 4. It commonly contains mottles with chroma of 2 to 8. The 2BC horizon has hue of 7.5YR, value of 4 to 6, and chroma of 2 to 8. It is stratified sandy loam, loam, or silt loam.

Elvers Series

The Elvers series consists of deep, poorly drained soils on flood plains. These soils formed in silty alluvium over herbaceous organic deposits. Permeability is moderate in the silty alluvium and moderately rapid in the underlying organic material. Slopes range from 0 to 2 percent.

Elvers soils are similar to Houghton soils and are commonly adjacent to Houghton and Wakeland soils. Houghton soils are very poorly drained and are in the slightly lower positions. They formed entirely in organic deposits extending to a depth of more than 51 inches. Wakeland soils are somewhat poorly drained and are in the slightly higher positions. They formed entirely in silty alluvium.

Typical pedon of Elvers silt loam, rarely flooded, 560 feet west and 1,780 feet south of the northeast corner of sec. 7, T. 21 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; few faint pale brown (10YR 6/3) sand grains on faces of peds; neutral; abrupt smooth boundary.

Cg—8 to 28 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; common fine prominent strong brown (7.5YR 5/6) and few fine faint gray (10YR 5/1) mottles; massive; friable; few thin strata of pale brown (10YR 6/3) and very dark gray (10YR 3/1) silt loam and very fine sand; few fine manganese stains; neutral; abrupt wavy boundary.

Oa—28 to 60 inches; sapric material, black (N 2/0) broken face and rubbed; about 20 percent fiber, less than 5 percent rubbed; weak medium platy structure; friable; neutral.

The thickness of the silty mineral soil material ranges from 16 to 40 inches.

The Ap horizon has value of 2 to 4 and chroma of 1 or 2. The Cg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2.

Faxon Series

The Faxon series consists of moderately deep, poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium over limestone bedrock. Slopes range from 0 to 2 percent.

The Faxon soils in this survey area are taxadjuncts because they have a lower content of sand coarser than very fine sand in the control section than is defined as the range for the series. Also, they have an irregular decrease in organic carbon. These differences, however, do not affect the use or behavior of the soils.

Faxon soils are commonly adjacent to Ambraw, Otter, and Riley soils. Ambraw, Otter, and Riley soils do not have a lithic contact within a depth of 60 inches. Ambraw and Otter soils are in landscape positions similar to those of the Faxon soils. Ambraw soils contain more sand in the control section than the Faxon soils. Otter soils have a mollic epipedon that is more than 24 inches thick. Riley soils are somewhat poorly drained and are slightly higher on the landscape than the Faxon soils. They formed in loamy alluvium over sandy alluvium.

Typical pedon of Faxon silty clay loam, rarely flooded, 760 feet west and 180 feet south of the center of sec. 30, T. 21 N., R. 3 E.

Ap—0 to 9 inches; black (N 2/0) silty clay loam, black (5Y 2.5/1) dry; weak medium subangular blocky structure parting to weak fine and medium granular; friable; neutral; abrupt smooth boundary.

AB—9 to 16 inches; very dark gray (5Y 3/1) silty clay loam, dark gray (5Y 4/1) dry; few fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; mildly alkaline; clear smooth boundary.

Bg—16 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine faint light brownish gray (2.5Y 6/2) mottles; strong fine and medium angular blocky structure; friable; common faint very dark grayish brown (2.5Y 3/2) organic films on faces of peds; mildly alkaline; clear smooth boundary.

BCg—20 to 27 inches; olive gray (5Y 5/2) silt loam; few fine prominent strong brown (7.5YR 5/6) and common fine faint olive gray (5Y 4/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few faint dark olive gray (5Y 3/1) organic films on faces of peds; few manganese stains; slight effervescence; mildly alkaline; clear irregular boundary.

2R—27 inches; hard, fractured limestone bedrock; white (2.5Y 8/0), soft, calcareous, weathered limestone in the upper 2 inches.

The thickness of the solum and the depth to limestone bedrock range from 20 to 40 inches. The thickness of the mollic epipedon ranges from 13 to 24 inches.

The Ap horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1.

Fayette Series

The Fayette series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 10 percent.

Fayette soils are similar to and are commonly adjacent to Downs and Rozetta soils. Downs soils are moderately well drained and are on side slopes and on the slightly broader ridges. They have a darker surface layer than the Fayette soils. Rozetta soils are moderately well drained and are on side slopes, in coves, and on the slightly broader ridges.

Typical pedon of Fayette silt loam, 5 to 10 percent slopes, eroded, 1,840 feet north and 2,400 feet west of the southeast corner of sec. 17, T. 22 N., R. 7 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure parting to weak fine granular; friable; few yellowish brown (10YR 5/4) fragments of subsoil material; slightly acid; abrupt smooth boundary.

Bt1—6 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; many faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—21 to 31 inches; yellowish brown (10YR 5/4) silt loam; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; few faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

BC—31 to 43 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; gradual smooth boundary.

C—43 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; slightly acid.

The thickness of the solum ranges from 42 to 60 inches.

The Ap horizon has value of 4 or 5 and chroma of 1 to 3. The E horizon, if it occurs, has value of 4 or 5 and chroma of 1 to 4. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is neutral to very strongly acid in the upper part and slightly acid or medium acid in the lower part. Some pedons have mottles in the BC and C horizons.

Gilford Series

The Gilford series consists of deep, very poorly drained soils on outwash plains and stream terraces. These soils formed in loamy and sandy sediments. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Gilford soils are similar to Marshan soils and are commonly adjacent to Hoopeston and Sparta soils. Marshan soils contain more clay in the upper part of the control section than the Gilford soils. They are in landscape positions similar to those of the Gilford soils. Hoopeston soils are somewhat poorly drained and are in the slightly higher positions. Sparta soils are excessively drained and are in the higher positions. They contain more sand in the solum than the Gilford soils.

Typical pedon of Gilford loam, 1,840 feet north and 1,180 feet east of the southwest corner of sec. 14, T. 19 N., R. 4 E.

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A—8 to 18 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to weak medium and fine granular; friable; neutral; clear smooth boundary.

BA—18 to 22 inches; dark grayish brown (2.5Y 4/2) sandy loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium and fine subangular blocky structure; very friable; many distinct very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

Bg—22 to 32 inches; grayish brown (2.5Y 5/2) sandy loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very friable; krotovinas of very dark gray (10YR 3/1) sandy loam between depths of 29 and 32 inches; neutral; abrupt wavy boundary.

2Cg—32 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; neutral.

The thickness of the solum ranges from 20 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 Bg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It is fine sandy loam or sandy loam. The 2Cg horizon has hue of 2.5Y, value of 5 to 7, and chroma of 1 to 3. It is loamy sand, sand, or coarse sand.

Gilford loam, occasionally flooded, has stratified textures below the mollic epipedon that are not definitive for the series. This difference, however, does not affect the use or behavior of the soil.

Hickory Series

The Hickory series consists of deep, well drained, moderately permeable soils on side slopes in the uplands. These soils formed in a thin layer of loess and in the underlying Illinoian glacial till. Slopes range from 12 to 35 percent.

Hickory soils are similar to and are commonly adjacent to Fayette, Seaton, and Timula soils. Fayette, Seaton, and Timula soils formed entirely in loess. They are upslope from the Hickory soils. Seaton and Timula soils contain less clay in the control section than the Hickory soils.

Typical pedon of Hickory silt loam, 18 to 35 percent slopes, eroded, 460 feet west and 460 feet north of the southeast corner of sec. 9, T. 21 N., R. 6 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few yellowish brown (10YR 5/4) fragments of subsoil material; medium acid; clear smooth boundary.

Bt1—5 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; few distinct dark grayish brown (10YR 4/2) clay films in root channels and on faces of peds; few very pale brown (10YR 7/3 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

2Bt2—12 to 23 inches; yellowish brown (10YR 5/4) clay loam; few fine prominent light brownish gray (2.5Y 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; many very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine concretions of manganese oxide; few fine pebbles; medium acid; clear smooth boundary.

2Bt3—23 to 30 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few fine stains of manganese oxide; few fine pebbles; slightly acid; clear wavy boundary.

2Bt4—30 to 35 inches; yellowish brown (10YR 5/4) clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few fine stains of manganese oxide; common fine pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

2Bt5—35 to 46 inches; yellowish brown (10YR 5/4) loam; common medium distinct light yellowish brown (2.5Y 6/4) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine concretions of manganese oxide; few fine pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

2BC—46 to 60 inches; light yellowish brown (10YR 6/4) loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few fine concretions of manganese oxide; few fine pebbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to more than 60 inches. The loess is less than 20 inches thick. The thickness of the surface soil ranges from 4 to 7 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is silty clay loam or silt loam. The 2Bt and 2BC horizons have hue of 7.5YR, value of 4 to 6, and chroma of 3 to 6. They are clay loam, loam, or silty clay loam.

Hononegah Series

The Hononegah series consists of deep, excessively drained, very rapidly permeable soils on stream terraces. These soils formed in sandy alluvium over calcareous sand and gravel. Slopes range from 1 to 4 percent.

Hononegah soils are similar to Sparta soils and are commonly adjacent to Dickinson, Waukee, and Waukegan soils. Dickinson, Waukee, and Waukegan soils are well drained. Sparta and Dickinson soils are in landscape positions similar to those of the Hononegah soils. Dickinson soils contain more clay in the control section than the Hononegah soils and do not have gravel in the substratum. Sparta soils do not have gravel in the substratum. Waukee and Waukegan soils are in the slightly lower positions. Waukee soils have more clay in the solum than the Hononegah soils, and Waukegan soils have more silt and clay in the solum.

Typical pedon of Hononegah loamy sand, 1 to 4 percent slopes, 1,720 feet east and 1,020 feet north of the southwest corner of sec. 16, T. 20 N., R. 6 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A1—7 to 13 inches; very dark grayish brown (10YR 3/2) loamy sand, brown (10YR 4/3) dry; weak fine and medium granular structure; very friable; neutral; clear smooth boundary.

A2—13 to 19 inches; very dark grayish brown (10YR 3/2) loamy sand, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bw—19 to 23 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; very friable; few pebbles; neutral; abrupt smooth boundary.

2BC—23 to 28 inches; brown (10YR 4/3) gravelly loamy sand; weak fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

2C1—28 to 37 inches; dark yellowish brown (10YR 4/4) gravelly sand; single grain; loose; neutral; abrupt smooth boundary.

2C2—37 to 54 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; slight effervescence; mildly alkaline; abrupt smooth boundary.

2C3—54 to 60 inches; brown (10YR 4/3) very gravelly sand; single grain; loose; slight effervescence; moderately alkaline.

The thickness of the solum, the depth to free carbonates, and the depth to gravelly material range from 20 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The Ap horizon is loamy sand or sandy loam. The Bw horizon is loamy sand, sand, loamy coarse sand, or coarse sand.

Hoopeston Series

The Hoopeston series consists of deep, somewhat poorly drained soils on outwash plains and stream terraces. These soils formed in loamy and sandy outwash. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Hoopeston soils are similar to Lawler soils and are commonly adjacent to Dickinson, Gilford, and Sparta soils. Dickinson soils are somewhat excessively drained and well drained and are in the slightly higher positions. Gilford soils are very poorly drained and are in the lower positions that are subject to ponding. Lawler soils contain more clay in the solum than the Hoopeston soils. They are in landscape positions similar to those of the Hoopeston soils. Sparta soils are excessively drained and are in the slightly higher positions. They contain more sand in the solum than the Hoopeston soils.

Typical pedon of Hoopeston sandy loam, 2,530 feet south and 1,060 feet east of the northwest corner of sec. 14, T. 19 N., R. 4 E.

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; neutral; clear smooth boundary.

A—10 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; very friable; common faint very dark brown (10YR 2/2) organic films on faces of peds; neutral; clear smooth boundary.

Bw1—14 to 21 inches; brown (10YR 5/3) sandy loam; common fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; few faint very dark grayish brown (10YR 3/2) organic fillings in root channels; few faint very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bw2—21 to 38 inches; brown (10YR 5/3) sandy loam; common fine prominent yellowish brown (10YR 5/8) and common fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

C—38 to 60 inches; pale brown (10YR 6/3) sand; common fine faint light brownish gray (10YR 6/2) and common fine prominent yellowish brown (10YR 5/8) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 20 to 45 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon is sandy loam, fine sandy loam, or loam. The Bw horizon has value of 4 to 6 and chroma of 2 or 3. It typically is sandy loam or fine sandy loamy, but in some pedons it is loamy sand in the lower part. The C horizon is loamy sand or sand.

Houghton Series

The Houghton series consists of deep, very poorly drained soils on flood plains. These soils formed in herbaceous organic deposits more than 51 inches thick. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Houghton soils are similar to Adrian, Elvers, and Palms soils and are commonly adjacent to Elvers, Lena, and Palms soils. Adrian, Lena, and Palms soils are in landscape positions similar to those of the Houghton soils. Adrian soils have a sandy substratum within a depth of 51 inches. Lena soils are calcareous throughout. Palms soils have a silty substratum within a depth of 51 inches. Elvers soils are poorly drained and are slightly higher on the landscape than the Houghton soils. They contain silty alluvium in the upper part.

Typical pedon of Houghton muck, rarely flooded, 1,500 feet west and 1,120 feet north of the southeast corner of sec. 7, T. 21 N., R. 4 E.

Oap—0 to 8 inches; sapric material, black (10YR 2/1) broken face and rubbed; less than 5 percent fiber, less than 2 percent rubbed; weak medium subangular blocky structure parting to weak fine granular; friable; medium acid; abrupt smooth boundary.

Oa1—8 to 23 inches; sapric material, black (10YR 2/1) broken face, dark reddish brown (5YR 2.5/2) rubbed; about 30 percent fiber, 10 percent rubbed; moderate thick and medium platy structure; friable; medium acid; clear smooth boundary.

Oa2—23 to 34 inches; sapric material, black (N 2/0) broken face and rubbed; about 10 percent fiber, less than 5 percent rubbed; weak thick platy structure; friable; few dark red (2.5YR 3/6) stains along fibers; slightly acid; clear smooth boundary.

Oa3—34 to 55 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; massive; friable; slightly acid; clear smooth boundary.

Oa4—55 to 60 inches; sapric material, black (N 2/0) broken face and rubbed; about 30 percent fiber, 15 percent rubbed; massive; friable; slightly acid.

The thickness of the sapric material is more than 51 inches. Reaction ranges from medium acid to mildly alkaline throughout. Some pedons have thin strata of hemic or fibric material.

Huntsville Series

The Huntsville series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Huntsville soils are similar to Ross soils and are commonly adjacent to Coffeen and Lawson soils. Coffeen, Lawson, and Ross soils are in landscape positions similar to those of the Huntsville soils. Coffeen and Lawson soils are somewhat poorly drained. Coffeen soils contain less clay in the control section than the Huntsville soils and have a thinner dark surface soil. Ross soils contain more sand in the solum than the Huntsville soils.

Typical pedon of Huntsville silt loam, frequently flooded, 2,240 feet east and 2,520 feet south of the northwest corner of sec. 17, T. 21 N., R. 7 E.

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; few faint very dark gray (10YR 3/1) organic films on faces of peds; neutral; abrupt smooth boundary.

A1—7 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many faint very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

A2—16 to 26 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

A3—26 to 32 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common distinct very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

AC—32 to 47 inches; brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; neutral; clear smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few faint brown (10YR 4/3) films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; neutral.

The thickness of the mollic epipedon ranges from 24 to 40 inches. The A horizon has value of 2 or 3 and chroma of 1 to 3.

Joslin Series

The Joslin series consists of deep, well drained, moderately slowly permeable soils on stream terraces. These soils formed in silty material and in the underlying lacustrine sediments. Slopes range from 0 to 2 percent.

The Joslin soils in this survey area are taxadjuncts because they have less than 15 percent sand coarser than very fine sand in the upper 20 inches of the argillic horizon, which is outside the range defined for the series. This difference, however, does not affect the use or behavior of the soils.

Joslin soils are similar to Raddle soils and are commonly adjacent to Denrock, Dickinson, and Raddle soils. Denrock soils are somewhat poorly drained and are on the slightly lower terraces. Dickinson and Raddle soils are in landscape positions similar to those of the Joslin soils. Also, they do not have lacustrine material in the solum. Dickinson soils contain more sand and less clay in the solum than the Joslin soils.

Typical pedon of Joslin silt loam, 150 feet north and 1,200 feet east of the southwest corner of sec. 19, T. 19 N., R. 5 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; medium acid; clear smooth boundary.

BA—15 to 21 inches; brown (10YR 4/3) silt loam; moderate medium and fine subangular blocky structure; friable; common faint dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.

Bt1—21 to 31 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; few faint brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—31 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; abrupt smooth boundary.

2Bt3—38 to 50 inches; brown (7.5YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common distinct reddish brown (5YR 5/3) clay films on faces of peds; 1-inch strata of yellowish brown (10YR 5/4) silt loam at a depth of 47 inches; medium acid; abrupt smooth boundary.

3BC—50 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; few fine prominent light brownish gray (2.5Y 6/2) mottles; weak coarse and medium prismatic structure; friable; slightly acid.

The thickness of the solum ranges from 48 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 Bt horizon has value of 4 or 5 and chroma of 3 to 6. The 2Bt horizon has value and chroma of 4 to 6. It is silty clay loam, clay, or silty clay and averages between 35 to 50 percent clay. The 3BC horizon is silty clay loam, silt loam, loam, or clay loam. The 3C horizon, if it occurs, is silt loam or loam that has strata of sandy loam, loamy sand, or sand.

Joy Series

The Joy series consists of deep, somewhat poorly drained, moderately permeable soils on uplands and outwash plains. These soils formed in loess. Slopes range from 0 to 2 percent.

Joy soils are similar to Muscatine soils and are commonly adjacent to Mt. Carroll, Port Byron, and Sable soils. Port Byron soils are well drained and are in the more sloping or slightly higher positions. Muscatine soils contain more clay in the subsoil than the Joy soils. They are in landscape positions similar to those of the Joy soils. Sable soils are poorly drained and are in slight depressions that are subject to ponding. Mt. Carroll soils are well drained and are in the more sloping or slightly higher positions. They have a thinner dark surface layer than the Joy soils.

Typical pedon of Joy silt loam, 810 feet east and 2,440 feet south of the northwest corner of sec. 12, T. 20 N., R. 3 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; neutral; abrupt smooth boundary.

A—9 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common faint very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.

BA—15 to 21 inches; brown (10YR 4/3) silt loam; few fine faint brown (10YR 5/3) mottles; moderate medium and fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) films on faces of peds; common distinct very dark gray (10YR 3/1) organic coatings in root channels; neutral; clear smooth boundary.

Bw1—21 to 27 inches; brown (10YR 5/3) silt loam; common fine faint yellowish brown (10YR 5/4) mottles; moderate medium and fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic coatings in root channels; few fine iron stains; neutral; clear smooth boundary.

Bw2—27 to 37 inches; brown (10YR 5/3) silt loam; common fine distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; moderate medium and fine subangular blocky structure; few faint dark grayish brown (10YR 4/2) films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic coatings in root channels; few fine stains of iron and manganese oxide; neutral; clear smooth boundary.

Bw3—37 to 44 inches; brown (10YR 5/3) silt loam; common fine distinct yellowish brown (10YR 5/6 and 5/8) and common fine faint light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; few faint dark grayish brown (10YR 4/2) films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic coatings in root channels; few fine concretions and stains of iron and manganese oxide; neutral; gradual smooth boundary.

BCg—44 to 51 inches; grayish brown (10YR 5/2) silt loam; many fine distinct yellowish brown (10YR 5/6) and common fine prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; few stains and concretions of iron and manganese oxide; neutral; gradual smooth boundary.

Cg—51 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many fine prominent yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; massive; friable; few fine concretions and stains of iron and manganese oxide; neutral.

The thickness of the solum ranges from 36 to 55 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches. The depth to free carbonates ranges from 40 to more than 60 inches.

The A horizon has value of 2 and chroma of 1 to 3. The Bw horizon has hue of 2.5Y, value of 4 to 6, and chroma of 2 to 4. It ranges from neutral to strongly acid. It has a B/A clay ratio of less than 1.2. In some pedons loamy sand or sand is within a depth of 60 inches.

Lacrescent Series

The Lacrescent series consists of deep, well drained soils on uplands. These soils formed in loamy and loamy-skeletal colluvium derived from limestone bedrock. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 25 to 60 percent.

Lacrescent soils are similar to Whalan soils and are commonly adjacent to Lamont, Seaton, and Timula soils. Lamont, Seaton, and Timula soils have a lighter colored surface soil than the Lacrescent soils and do not contain coarse fragments. They are upslope from the Lacrescent soils. Seaton and Timula soils contain less sand in the control section than the Lacrescent soils. Whalan soils have a lighter colored surface soil than the Lacrescent soils, do not contain coarse fragments in the solum, and have a lithic contact within a depth of 40 inches. They are on high limestone benches.

Typical pedon of Lacrescent cobbly loam, 25 to 60 percent slopes, 1,980 feet east and 700 feet north of the southwest corner of sec. 5, T. 22 N., R. 4 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) cobbly loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; about 15 percent cobblestones and pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

A2—5 to 12 inches; dark brown (10YR 3/3) cobbly loam, brown (10YR 5/3) dry; weak moderate and fine granular structure; very friable; about 15 percent cobblestones and pebbles; violent effervescence; mildly alkaline; clear smooth boundary.

Bw—12 to 36 inches; brown (10YR 4/3) very cobbly loam; weak fine subangular blocky structure parting to weak fine granular; very friable; few faint very dark grayish brown (10YR 3/2) organic films in root channels; about 40 percent cobblestones and pebbles; violent effervescence; mildly alkaline; clear smooth boundary.

C—36 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam; massive; very friable; about 60 percent cobblestones and pebbles; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 36 inches. The depth to limestone bedrock ranges from 3.5 to 10 feet. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon is silt loam, loam, or cobbly loam. The Bw horizon is cobbly fine sandy loam, cobbly loam, or very cobbly loam. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is very cobbly loam or very cobbly fine sandy loam.

Lamont Series

The Lamont series consists of deep, well drained soils on stream terraces and outwash plains. These soils formed in loamy and sandy sediments reworked by the wind. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 2 to 45 percent.

Lamont soils are similar to Dickinson, Tell, and Waukegan soils and are commonly adjacent to Tell and Waukegan soils. Dickinson, Tell, and Waukegan soils are in landscape positions similar to those of the Lamont soils. Dickinson and Waukegan soils have a mollic epipedon. Tell and Waukegan soils formed in loess over sandy outwash.

Typical pedon of Lamont loam, 2 to 7 percent slopes, eroded, 660 feet south and 2,160 feet west of the northeast corner of sec. 36, T. 22 N., R. 5 E.

Ap—0 to 7 inches; brown (10YR 4/3) loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few dark yellowish brown (10YR 4/6) fragments of subsoil material; strongly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; dark yellowish brown (10YR 4/6) loam; moderate fine subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—13 to 22 inches; dark yellowish brown (10YR 4/6) sandy loam; weak medium subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—22 to 27 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; few distinct brown (7.5YR 5/4) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt4—27 to 44 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable; common distinct brown (7.5YR 5/4) clay films on faces of peds; medium acid; gradual smooth boundary.

E&Bt—44 to 60 inches; strong brown (7.5YR 5/6) sand (E part); single grain; loose; few brown (7.5YR 5/4) lamellae of sandy loam 1 to 3 inches thick (Bt part); slightly acid.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the surface soil ranges from 6 to 10 inches.

The Ap or A horizon is loam or fine sandy loam. It ranges from strongly acid to neutral. The Bt horizon has hue of 10YR or 7.5YR and chroma of 4 to 6. It ranges from strongly acid to neutral. The E part of the E&Bt horizon is sand, fine sand, or loamy sand. The Bt part has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam, loamy fine sand, or loamy sand. The E&Bt horizon ranges from strongly acid to mildly alkaline.

Lawler Series

The Lawler series consists of deep, somewhat poorly drained soils on stream terraces and outwash plains. These soils formed in loamy sediments over sandy outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 2 percent.

Lawler soils are similar to Udolpho soils and are commonly adjacent to Dickinson, Marshan, and Udolpho soils. Dickinson soils are well drained and somewhat excessively drained and are slightly higher on the landscape than the Lawler soils. Also, they contain less clay in the solum than the Lawler soils. Marshan soils are very poorly drained and are in the slightly lower positions that are subject to ponding. Udolpho soils are poorly drained and are in landscape positions similar to those of the Lawler soils. They have a thinner dark surface layer than the Lawler soils.

Typical pedon of Lawler loam, 2,180 feet west and 160 feet north of the southeast corner of sec. 28, T. 20 N., R. 6 E.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; weak medium and fine granular structure; friable; medium acid; abrupt smooth boundary.

AB—10 to 15 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many faint black (10YR 2/1) organic films on faces of peds; medium acid; clear smooth boundary.

Bw1—15 to 21 inches; brown (10YR 5/3) silt loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; many faint dark grayish brown (10YR 4/2) films on faces of peds; strongly acid; clear smooth boundary.

Bw2—21 to 26 inches; brown (10YR 5/3) silt loam; common fine faint grayish brown (10YR 5/2) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few faint dark grayish brown (10YR 4/2) films on faces of peds; strongly acid; clear smooth boundary.

Bg—26 to 36 inches; grayish brown (10YR 5/2) loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate coarse and medium subangular blocky structure; friable; few fine rounded concretions of iron and manganese oxide; strongly acid; abrupt smooth boundary.

2C—36 to 54 inches; brown (7.5YR 5/4) coarse sand; common fine prominent yellowish brown (10YR 5/8) mottles; single grain; loose; about 5 percent gravel; strongly acid; abrupt smooth boundary.

2Cg—54 to 60 inches; dark grayish brown (2.5Y 4/2) coarse sand; single grain; loose; about 5 percent gravel; medium acid.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The AB horizon has chroma of 1 or 2. The Bw horizon has value of 2.5Y, value of 4 or 5, and chroma of 2 to 6. It ranges from strongly acid to slightly acid. The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 1 to 4. It is coarse sand or gravelly coarse sand.

Lawson Series

The Lawson series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Lawson soils are similar to Coffeen and Orion soils and are commonly adjacent to Huntsville, Orion, and Otter soils. Coffeen, Huntsville, and Orion soils are in landscape positions similar to those of the Lawson soils. Coffeen soils contain less clay in the control section than the Lawson soils and have a thinner dark surface soil. Huntsville soils are well drained. Orion soils have light-colored, silty, stratified sediments over a dark buried soil. Otter soils are poorly drained and are in the lower positions that are subject to ponding.

Typical pedon of Lawson silt loam, frequently flooded, 170 feet north and 1,190 feet east of the southwest corner of sec. 18, T. 21 N., R. 7 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A1—8 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; many faint black (10YR 2/1) organic films on faces of peds; slightly acid; gradual smooth boundary.

A2—17 to 30 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine faint brown (10YR 4/3) mottles; moderate fine subangular blocky structure parting to moderate fine granular; friable; few faint black (10YR 2/1) organic films on faces of peds; slightly acid; clear smooth boundary.

A3—30 to 35 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine faint dark grayish brown (10YR 4/2) and brown (10YR 4/3) mottles; moderate fine subangular blocky structure; friable; few faint very dark gray (10YR 3/1) organic films on faces of peds; slightly acid; clear smooth boundary.

AC—35 to 44 inches; dark grayish brown (10YR 4/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

Cg1—44 to 51 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct gray (10YR 5/1) and few fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral; clear smooth boundary.

Cg2—51 to 60 inches; grayish brown (10YR 5/2) and dark grayish brown (2.5Y 4/2) loam; few fine faint gray (10YR 5/1) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the mollic epipedon ranges from 24 to 36 inches. In some pedons the Cg horizon is silt loam throughout.

Lena Series

The Lena series consists of deep, very poorly drained soils on flood plains. These soils formed in calcareous, herbaceous organic deposits more than 51 inches thick. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Lena soils are commonly adjacent to Adrian, Elvers, and Houghton soils. Adrian, Elvers, and Houghton soils are noncalcareous. Adrian and Houghton soils are in landscape positions similar to those of the Lena soils. Adrian soils have a sandy substratum within a depth of 51 inches. Elvers soils are poorly drained and are slightly higher on the landscape than the Lena soils. They contain silty alluvium in the upper part of the profile.

Typical pedon of Lena muck, rarely flooded, 2,220 feet west and 1,500 feet north of the southeast corner of sec. 7, T. 21 N., R. 4 E.

Oap—0 to 8 inches; sapric material, black (10YR 2/1) broken face and rubbed; less than 5 percent fiber, less than 5 percent rubbed; weak fine subangular blocky structure parting to weak fine granular; friable; violent effervescence; mildly alkaline; abrupt smooth boundary.

Oa1—8 to 19 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 10 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; friable; many white (10YR 8/1) accumulations of calcium carbonate and common strong brown (7.5YR 5/8) accumulations of iron in the upper 2 inches; strong effervescence; mildly alkaline; clear smooth boundary.

Oa2—19 to 27 inches; sapric material, black (N 2/0) broken face and rubbed; less than 10 percent fiber, less than 5 percent rubbed; weak medium subangular blocky structure; friable; few thin strata of very dark gray (10YR 3/1) and light gray (10YR 7/1) mucky silt loam; few snail-shell fragments; few fine accumulations of calcium carbonate; violent effervescence; moderately alkaline; clear smooth boundary.

Oa3—27 to 36 inches; sapric material, black (10YR 2/1) broken face and rubbed; 15 percent fiber, less than 5 percent rubbed; weak medium subangular blocky structure; friable; few snail-shell fragments; strong effervescence; mildly alkaline; clear smooth boundary.

Oa4—36 to 45 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 20 percent fiber, less than 5 percent rubbed; weak medium platy structure; friable; slight effervescence; mildly alkaline; clear smooth boundary.

Oa5—45 to 60 inches; sapric material, black (N 2/0) broken face and rubbed; about 15 percent fiber, less than 5 percent rubbed; weak medium platy structure; friable; slight effervescence; mildly alkaline.

The sapric material is more than 51 inches thick. Some pedons have thin strata of hemic or fibric material.

Littleton Series

The Littleton series consists of deep, somewhat poorly drained, moderately permeable soils on terraces and alluvial fans. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Littleton soils are similar to Joy soils and are commonly adjacent to Lamont, Raddle, and Seaton soils. Joy soils have a thinner mollic epipedon than the Littleton soils. They are on uplands. Lamont and Seaton soils are well drained and are on the side slopes of terraces and on uplands above the Littleton soils. They have a lighter colored surface soil than the Littleton soils. Lamont soils contain more sand throughout than the Littleton soils. Raddle soils are well drained and are on the slightly higher terraces and alluvial fans. They have a thinner mollic epipedon than the Littleton soils.

Typical pedon of Littleton silt loam, 200 feet north and 1,420 feet east of the southwest corner of sec. 16, T. 20 N., R. 4 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; clear smooth boundary.

A1—8 to 20 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and very fine subangular blocky structure parting to moderate fine granular; friable; few very thin discontinuous strata of brown (10YR 5/3) silt loam; slightly acid; clear smooth boundary.

A2—20 to 36 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

BA—36 to 52 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; many faint grayish brown (10YR 5/2) films on faces of peds and lining root channels; common distinct very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

Bg—52 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; strong medium prismatic structure; friable; many faint grayish brown (10YR 5/2) films on faces of peds; few fine concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 50 to 62 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The overwash sediments have value of 4 or 5 and chroma of 2 or 3. Some pedons have a Cg horizon. This horizon is mottled and typically is silt loam.

Marshan Series

The Marshan series consists of deep, very poorly drained soils on outwash plains. These soils formed in loamy sediments over sandy outwash. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Marshan soils are similar to Gilford soils and are commonly adjacent to Dickinson, Lawler, and Udolpho soils. Dickinson soils are well drained and somewhat excessively drained and are higher on the landscape than the Marshan soils. They contain less clay in the solum than the Marshan soils. Lawler soils are somewhat poorly drained and are in the slightly higher positions. Gilford soils contain less clay in the solum than the Marshan soils. They are in landscape positions similar to those of the Marshan soils. Udolpho soils are poorly drained and are slightly higher on the landscape than the Marshan soils. They have a thinner dark surface layer than the Marshan soils.

Typical pedon of Marshan loam, 100 feet west and 1,680 feet north of the southeast corner of sec. 11, T. 20 N., R. 7 E.

Ap—0 to 9 inches; black (N 2/0) loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 16 inches; black (N 2/0) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure parting to moderate medium granular; friable; slightly acid; clear smooth boundary.

AB—16 to 23 inches; black (5Y 2.5/1) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; few fine iron stains; few pebbles; neutral; clear wavy boundary.

2Bg—23 to 34 inches; gray (5Y 5/1) and dark gray (5Y 4/1) loam; few fine prominent dark yellowish brown (10YR 4/6) and few fine distinct olive (5Y 4/4) mottles; weak medium subangular blocky structure; friable; black (5Y 2.5/1) krotovinas; few pebbles; neutral; abrupt smooth boundary.

2Cg—34 to 49 inches; grayish brown (2.5Y 5/2) coarse sand; single grain; loose; about 5 percent gravel; neutral; abrupt smooth boundary.

2C—49 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon is loam, silty clay loam, silt loam, or clay loam. The Bg horizon typically has hue of 2.5Y, value of 4 or 5, and chroma of 1 or 2, but in some pedons it has hue of 10YR, value of 4 or 5, and chroma of 1. It is typically clay loam or loam, but the range includes sandy loam in the lower part. The 2Cg or 2C horizon is sand, coarse sand, gravelly sand, or gravelly coarse sand.

Medway Series

The Medway series consists of deep, moderately well drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Medway soils are similar to Coffeen soils and are commonly adjacent to Ambraw, Beaucoup, and Zumbro soils. Ambraw and Beaucoup soils are poorly drained and are in the lower positions that are subject to ponding. Beaucoup soils formed in silty alluvium. Coffeen and Zumbro soils are in landscape positions similar to those of the Medway soils. Zumbro soils are well drained, and Coffeen soils are somewhat poorly drained. Zumbro soils contain more sand throughout than the Medway soils. Coffeen soils contain more silt and less sand and clay in the control section than the Medway soils.

Typical pedon of Medway loam, rarely flooded, 440 feet north and 2,460 feet west of the southeast corner of sec. 26, T. 20 N., R. 4 E.

Ap—0 to 11 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium and fine subangular blocky structure; friable; few pebbles; neutral; abrupt smooth boundary.

A—11 to 19 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium and fine subangular blocky structure parting to moderate fine granular; friable; many faint black (10YR 2/1) organic films on faces of peds; few pebbles; neutral; clear smooth boundary.

BA—19 to 27 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; few pebbles; neutral; gradual smooth boundary.

Bw1—27 to 37 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse and medium subangular blocky structure;

friable; few distinct dark gray (10YR 4/1) coatings; few iron stains; few pebbles; neutral; abrupt smooth boundary.

Bw2—37 to 50 inches; yellowish brown (10YR 5/4) sandy clay loam stratified with thin lenses of sandy loam and gravelly sandy loam; few fine distinct grayish brown (10YR 5/2) and many fine prominent strong brown (7.5YR 5/8 and 5/6) mottles; weak coarse and medium subangular blocky structure; friable; few faint brown (10YR 5/3) films in root channels; band of very dark grayish brown (10YR 3/2) sandy clay loam 1 inch thick at a depth of 44 inches; few fine concretions of manganese oxide; few pebbles; neutral; abrupt smooth boundary.

C—50 to 60 inches; stratified dark grayish brown (10YR 4/2) sandy loam and loamy sand and brown (10YR 5/3) and yellowish brown (10YR 5/6) sand; few fine prominent strong brown (7.5YR 5/6) mottles; massive; very friable; few pebbles; neutral.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches. In some pedons free carbonates are in the lower part of the solum and in the substratum.

The A horizon is silt loam or loam. The Bw horizon has hue of 7.5YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. It dominantly is loam, silt loam, silty clay loam, clay loam, or sandy clay loam, but the range includes sandy loam in the lower part. This horizon ranges from slightly acid to moderately alkaline. The C horizon has hue of 2.5Y, value of 4 or 5, and chroma of 1 to 6. It typically is stratified loam, silt loam, sandy loam, sandy clay loam, or clay loam. It has strata of sand or loamy sand below a depth of 50 inches. It ranges from slightly acid to moderately alkaline.

Milford Series

The Milford series consists of deep, poorly drained, moderately slowly permeable soils in glacial lakebeds on outwash plains. These soils formed in lacustrine material. Slopes range from 0 to 2 percent.

Milford soils are similar to Drummer soils and are commonly adjacent to Drummer and Niota soils. Drummer and Niota soils are in landscape positions similar to those of the Milford soils. Drummer soils contain less clay in the control section than the Milford soils. Niota soils have a thinner dark surface layer than the Milford soils and contain more clay in the control section.

Typical pedon of Milford silty clay loam, 1,120 feet south and 540 feet west of the northeast corner of sec. 30, T. 19 N., R. 5 E.

Ap—0 to 7 inches; black (N 2/0) silty clay loam, dark gray (N 4/0) dry; moderate very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A—7 to 17 inches; black (N 2/0) silty clay, dark gray (N 4/0) dry; moderate fine and very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

AB—17 to 24 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate fine prismatic structure parting to strong fine subangular blocky; friable; many faint black (N 2/0) organic films on faces of peds; neutral; clear smooth boundary.

Bg1—24 to 34 inches; dark gray (5Y 4/1) silty clay loam; few fine faint gray (5Y 5/1) and few fine prominent yellowish brown (10YR 5/4) mottles; moderate fine prismatic structure parting to strong fine angular blocky; friable; few prominent very dark gray (10YR 3/1) organic films on faces of peds; black (N 2/0) krotovinas 1 inch wide at a depth of 26 inches; neutral; gradual smooth boundary.

Bg2—34 to 43 inches; olive gray (5Y 5/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) and few fine faint dark gray (5Y 4/1) mottles; moderate medium prismatic structure; friable; few prominent dark gray (10YR 4/1) organic fillings in root channels; neutral; abrupt smooth boundary.

Cg—43 to 60 inches; light gray (5Y 6/1) silt loam; few fine prominent light olive brown (2.5Y 5/6) mottles; massive; friable; thin band of silt at a depth of 48 inches; common dark gray (5Y 4/1) krotovinas; neutral.

The thickness of the solum ranges from 38 to 50 inches. The thickness of the mollic epipedon ranges from 12 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. The Bg horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. It has high-chroma mottles. It is silty clay loam or silty clay.

Millington Series

The Millington series consists of deep, poorly drained, moderately permeable soils on flood plains. These soils formed in calcareous, loamy alluvium. Slopes range from 0 to 2 percent.

Millington soils are similar to Calco soils and are commonly adjacent to Ambraw and Titus soils. Ambraw, Calco, and Titus soils are in landscape positions similar to those of the Millington soils. Ambraw soils have a thinner dark surface soil than the Millington soils and are noncalcareous. Calco soils contain less sand in the control section than the Millington soils. Titus soils are noncalcareous and have a thinner dark surface soil than the Millington soils. Also, they contain more clay and less sand in the control section.

Typical pedon of Millington silt loam, wet, 700 feet south and 940 feet west of the northeast corner of sec. 25, T. 20 N., R. 4 E.

A—0 to 19 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; few snail-shell fragments; slightly effervescent; mildly alkaline; clear smooth boundary.

Bg—19 to 35 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; few fine prominent brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few snail-shell fragments; strongly effervescent; mildly alkaline; clear smooth boundary.

Cg—35 to 60 inches; olive gray (5Y 5/2) loam that has few thin strata of sandy loam; common medium prominent strong brown (7.5YR 5/8) and common medium faint dark gray (5Y 4/1) mottles; massive; friable; few snail-shell fragments; strongly effervescent; mildly alkaline.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The A horizon is silt loam, loam, or clay loam. The Bg horizon has hue of 2.5Y or is neutral in hue. It has value of 2 to 5 and chroma of 0 to 2. It is loam, silty clay loam, or clay loam and has strata of sandy loam in some pedons. The Bg and Cg horizons are mildly alkaline or moderately alkaline. The Cg horizon is stratified sandy loam to silty clay loam.

Millington clay loam, rarely flooded, has a thinner dark surface soil than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soil.

Mt. Carroll Series

The Mt. Carroll series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 15 percent.

Mt. Carroll soils are similar to Port Byron and Seaton soils and are commonly adjacent to Joy, Port Byron, and Seaton soils. Port Byron and Joy soils have a mollic epipedon. Port Byron soils are in landscape positions similar to those of the Mt. Carroll soils. Joy soils are somewhat poorly drained and are slightly lower on the landscape than the Mt. Carroll soils. Seaton soils have a light-colored surface layer. They are in landscape positions similar to those of the Mt. Carroll soils.

Typical pedon of Mt. Carroll silt loam, 2 to 5 percent slopes, 2,250 feet south and 720 feet east of the northwest corner of sec. 32, T. 22 N., R. 5 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E—7 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium platy structure; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; slightly acid; clear smooth boundary.

BE—10 to 17 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; many faint dark brown (10YR 3/3) organic films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic fillings in root channels; medium acid; clear smooth boundary.

Bt1—17 to 25 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium angular blocky structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; few distinct very dark grayish brown (10YR 3/2) organic fillings in root channels; many faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—25 to 39 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; common very dark grayish brown (10YR 3/2) wormcasts; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt3—39 to 55 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; gradual smooth boundary.

BC—55 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few small accumulations of manganese oxide; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the dark surface layer ranges from 6 to 9 inches.

The Ap horizon has value of 3 and chroma of 1 to 3. The Bt horizon has chroma of 3 to 6. Reaction in the Bt and BC horizons ranges from strongly acid to neutral.

The BC and C horizons have hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. In some pedons they are mottled. The C horizon is slightly acid or neutral.

Muscatine Series

The Muscatine series consists of deep, somewhat poorly drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

The Muscatine soils in this survey area are taxadjuncts because they have an argillic horizon, which is not definitive for the series. This difference, however, does not affect the use or behavior of the soils.

Muscatine soils are similar to and are commonly adjacent to Downs and Tama soils. Downs and Tama soils are moderately well drained and are in the more sloping or slightly higher positions. Downs soils have a thinner dark surface soil than the Muscatine soils.

Typical pedon of Muscatine silt loam, 240 feet west and 1,760 feet south of the northeast corner of sec. 1, T. 22 N., R. 6 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; slightly acid; abrupt smooth boundary.

A—7 to 13 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; clear smooth boundary.

AB—13 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium and fine subangular blocky structure; friable; many faint black (10YR 2/1) organic films on faces of peds; medium acid; clear smooth boundary.

Bt1—19 to 28 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate medium fine subangular blocky structure; friable; few distinct very dark gray (10YR 3/1) organic films on faces of peds; many faint dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—28 to 38 inches; pale brown (10YR 6/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; friable; common faint grayish brown (10YR 5/2) and few faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—38 to 55 inches; pale brown (10YR 6/3) silt loam; many fine distinct light brownish gray (2.5Y 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium and fine prismatic structure; friable; few faint grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; neutral; clear smooth boundary.

BCg—55 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/8) and few fine distinct gray (10YR 6/1) mottles; weak coarse prismatic structure; friable; few prominent very dark gray (10YR 3/1) organic films in root channels; few fine concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 50 to 60 inches. The thickness of the mollic epipedon ranges from 14 to 20 inches.

The Bt horizon has value of 4 to 6 and chroma of 2 to 4. The BCg horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2 or 3.

Muskego Series

The Muskego series consists of deep, very poorly drained soils on outwash plains. These soils formed in herbaceous organic deposits over coprogenous earth. Permeability is moderately rapid in the organic layers and slow in the coprogenous earth. Slopes range from 0 to 2 percent.

Muskego soils are commonly adjacent to Adrian and Marshan soils. Adrian and Marshan soils are in landscape positions similar to those of the Muskego soils. Adrian soils have organic deposits underlain by sandy material. Marshan soils formed in loamy over sandy materials.

Typical pedon of Muskego muck, 2,320 feet north and 1,920 feet east of the southwest corner of sec. 25, T. 19 N., R. 4 E.

Oap—0 to 10 inches; sapric material, black (N 2/0) broken face and rubbed; less than 2 percent fiber unrubbed and rubbed; weak fine subangular blocky structure parting to weak medium and fine granular; friable; neutral; abrupt smooth boundary.

Oa—10 to 18 inches; sapric material, black (N 2/0) broken face and rubbed; less than 2 percent fiber unrubbed and rubbed; few fine prominent reddish brown (5YR 4/4) mottles; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Oak—18 to 24 inches; sapric material, very dark grayish brown (10YR 3/2) broken face and rubbed; about 5 percent fiber, less than 2 percent rubbed; common fine prominent strong brown (7.5YR 4/6) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; many fine light gray (10YR 7/1) accumulations of calcium carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

C1—24 to 38 inches; dark brown (10YR 3/3) and light gray (10YR 7/1) coprogenous earth; common fine prominent yellowish brown (10YR 5/8) mottles; massive; friable; few snail-shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

C2—38 to 52 inches; very dark grayish brown (10YR 3/2) and black (10YR 2/1) coprogenous earth; common fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; few snail-shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

C3—52 to 60 inches; very dark grayish brown (2.5Y 3/2) coprogenous earth; common fine distinct olive brown (2.5Y 4/4) and common fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; few snail-shell fragments; strong effervescence; mildly alkaline.

The depth to coprogenous earth ranges from 16 to 36 inches.

The C horizon has hue of 5Y, value of 2 to 4, and chroma of 1 to 3. It ranges from neutral to moderately alkaline.

Niota Series

The Niota series consists of deep, poorly drained soils on stream terraces. These soils formed in silty material and in the underlying lacustrine and loamy sediments over sandy material. Permeability is very slow in the subsoil and moderate in the substratum. Slopes range from 0 to 2 percent.

Niota soils are similar to Thorp soils and are commonly adjacent to Denrock, Milford, and Raddle soils. Denrock, Milford, Raddle, and Thorp soils have a dark surface soil that is more than 10 inches thick. Denrock soils are somewhat poorly drained and are slightly higher on the landscape than the Niota soils. Milford soils are in positions on terraces similar to those of the Niota soils. Raddle soils are well drained and are on the higher terraces. They contain less clay in the subsoil than the Niota soils. Thorp soils contain less clay in the control section than the Niota soils. They are in landscape positions similar to those of the Niota soils.

Typical pedon of Niota silt loam, 660 feet east and 600 feet north of the southwest corner of sec. 8, T. 19 N., R. 5 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine granular structure; friable; neutral; abrupt smooth boundary.

Eg—9 to 16 inches; light brownish gray (2.5Y 6/2) silt loam; common medium and fine prominent strong brown (7.5YR 5/6) mottles; weak thin platy structure parting to moderate fine subangular blocky; friable; few prominent dark gray (10YR 4/1) organic coatings on faces of peds; medium acid; abrupt smooth boundary.

2Btg1—16 to 21 inches; grayish brown (2.5Y 5/2) silty clay; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium and fine subangular blocky structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear smooth boundary.

2Btg2—21 to 27 inches; grayish brown (2.5Y 5/2) silty clay; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few distinct pressure faces; medium acid; clear smooth boundary.

2Btg3—27 to 36 inches; light brownish gray (2.5Y 6/2) silty clay loam; few fine prominent brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; many faint light brownish gray (2.5Y 6/2) clay films on faces of peds; reddish brown (5YR 5/4) band one-half inch thick at a depth of 32 inches; medium acid; clear smooth boundary.

3BCg—36 to 49 inches; light brownish gray (2.5Y 6/2) silt loam; few fine prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure; friable; neutral; abrupt wavy boundary.

3Cg—49 to 60 inches; stratified light olive gray (5Y 6/2) loam and light brownish gray (2.5Y 6/2) loamy sand; few medium and fine prominent light olive brown (2.5Y 5/4) mottles; massive; very friable; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the loess material is less than 20 inches. The dark surface layer is 7 to 10 inches thick.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Eg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The 2Btg horizon has hue of 5Y, 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 1 to 4. It is dominantly silty clay or clay, but the range includes silty clay loam in the lower part. The 3BCg horizon is silt loam, silty clay loam, or loam. The 3Cg horizon is stratified silty clay loam, silt loam, loam, sandy loam, or loamy sand.

Oakville Series

The Oakville series consists of deep, well drained, rapidly permeable soils on outwash plains. These soils formed in wind-deposited sandy material. Slopes range from 4 to 15 percent.

Oakville soils are similar to Plainfield soils and are commonly adjacent to Joy and Tell soils. Joy soils are somewhat poorly drained and are lower on the landscape than the Oakville soils. They contain more silt and clay in the solum than the Oakville soils. Plainfield and Tell soils are in landscape positions similar to those of the Oakville soils. Plainfield soils are excessively drained. They contain more medium sand in the control section than the Oakville soils. Tell soils contain more silt and clay in the solum than the Oakville soils.

Typical pedon of Oakville loamy fine sand, in an area of Oakville-Tell complex, 10 to 15 percent slopes, eroded; 660 feet west and 400 feet north of the southeast corner of sec. 25, T. 19 N., R. 3 E.

Ap—0 to 9 inches; dark yellowish brown (10YR 3/4) loamy fine sand, light yellowish brown (10YR 6/4) dry; weak medium and fine subangular blocky structure; very friable; few dark yellowish brown (10YR 4/4) fragments of subsoil material; strongly acid; abrupt smooth boundary.

Bw1—9 to 18 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; strongly acid; gradual smooth boundary.

Bw2—18 to 33 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; slightly acid; gradual smooth boundary.

C—33 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 25 to 40 inches. The thickness of the surface soil ranges from 5 to 9 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. It is loamy fine sand or fine sand. The Bw horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loamy fine sand, fine sand, or sand. The C horizon has chroma of 3 to 6. It ranges from medium acid to mildly alkaline. In some pedons it has free carbonates.

Ogle Series

The Ogle series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and in the underlying glacial till. Slopes range from 2 to 10 percent.

Ogle soils are similar to Pecatonica and Port Byron soils and are commonly adjacent to Pecatonica, Tell, and Waukegan soils. Port Byron and Waukegan soils are in landscape positions similar to those of the Ogle soils. Port Byron soils formed entirely in loess. Waukegan soils formed in loess over sandy material. Tell soils have a light-colored surface soil and formed in loess over sandy material. They are downslope from the Ogle soils. Pecatonica soils have a light-colored surface soil. They have a thinner layer of loess than the Ogle soils and are closer to upland drainageways.

Typical pedon of Ogle silt loam, 2 to 5 percent slopes, 2,620 feet west and 1,220 feet north of the southeast corner of sec. 1, T. 22 N., R. 4 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common faint very dark gray (10YR 3/1) organic films on faces of peds; strongly acid; abrupt smooth boundary.

A—8 to 16 inches; dark brown (10YR 3/3) silt loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; medium acid; clear smooth boundary.

BA—16 to 24 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) and few faint dark brown (10YR 3/3) organic films on faces of peds; medium acid; clear smooth boundary.

Bt1—24 to 36 inches; yellowish brown (10YR 5/6) silt loam; moderate medium and fine subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) and brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—36 to 46 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; common distinct reddish brown (5YR 4/4) and few prominent dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; medium acid; clear smooth boundary.

2Bt3—46 to 60 inches; reddish brown (5YR 4/4) clay loam; moderate medium coarse subangular blocky structure; firm; common distinct yellowish red (5YR 5/6) and few prominent yellowish brown (10YR 5/6) clay films on faces of peds; few pebbles; medium acid.

The solum is more than 60 inches thick. The thickness of the loess ranges from 30 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. The 2Bt horizon has hue of 5YR and value and chroma of 4 to 6. It is clay loam, loam, silty clay loam, or sandy clay loam.

Orio Series

The Orio series consists of deep, poorly drained soils on outwash plains. These soils formed in loamy outwash. Permeability is moderately slow in the solum and rapid in the substratum. Slopes range from 0 to 2 percent.

Orio soils are similar to Marshan soils and are commonly adjacent to Dickinson, Sparta, and Udolpho soils. Marshan soils are very poorly drained and are in broad, low areas on outwash plains. They have a mollic epipedon and contain more sand within a depth of 40 inches than the Orio soils. Dickinson soils are well drained and somewhat excessively drained and are higher on the landscape than the Orio soils. They have a mollic epipedon and contain more sand in the solum than the Orio soils. Udolpho soils contain more sand within a depth of 40 inches than the Orio soils. Also, they are slightly higher on the landscape. Sparta soils are excessively drained and are higher on the landscape than the Orio soils. They have a mollic epipedon and contain more sand in the solum than the Orio soils.

Typical pedon of Orio loam, 2,340 feet west and 2,360 feet south of the northeast corner of sec. 35, T. 20 N., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; friable; slightly acid; abrupt smooth boundary.

Eg1—9 to 17 inches; dark grayish brown (10YR 4/2) loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate thin platy structure; friable; slightly acid; clear smooth boundary.

Eg2—17 to 20 inches; grayish brown (2.5Y 5/2) loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium platy structure; friable; few fine rounded accumulations of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Btg1—20 to 24 inches; dark grayish brown (2.5Y 4/2) loam; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium and fine subangular blocky structure; friable; few faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg2—24 to 31 inches; dark grayish brown (2.5Y 4/2) clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg3—31 to 40 inches; grayish brown (2.5Y 5/2) loam; common medium prominent brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; few fine rounded accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

BCg—40 to 58 inches; dark grayish brown (2.5Y 4/2) and olive gray (5Y 5/2) sandy clay loam that has thin strata of loamy fine sand, fine sandy loam, and loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; common distinct dark gray (10YR 4/1) organic coatings along root channels; few fine rounded accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Cg—58 to 60 inches; dark grayish brown (10YR 4/2) loamy sand; few fine faint grayish brown (10YR 5/2) and few fine distinct dark yellowish brown (10YR 4/4) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the dark surface layer ranges from 7 to 9 inches.

The Ap horizon is loam, sandy loam, or mucky sandy loam. The Eg horizon is loam, fine sandy loam, sandy loam, or loamy sand. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The Btg horizon is loam, sandy clay loam, or clay loam. The BCg horizon is sandy clay loam, loam, sandy loam, or loamy sand. The Cg horizon ranges from sand to loamy fine sand. It is stratified in some pedons.

Orion Series

The Orion series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in recent light-colored, silty alluvium over a buried, dark silty soil. Slopes range from 0 to 2 percent.

Orion soils are similar to and are commonly adjacent to Lawson and Wakeland soils. Lawson and Wakeland soils are in landscape positions similar to those of the Orion soils. Lawson soils have a mollic epipedon and do not have a buried soil. Wakeland soils do not have a dark buried soil within a depth of 40 inches.

Typical pedon of Orion silt loam, frequently flooded, 270 feet south and 1,000 feet east of the northwest corner of sec. 17, T. 22 N., R. 6 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; massive; friable; many thin strata of brown (10YR 4/3) and very dark gray (10YR 3/1) silt loam; neutral; abrupt smooth boundary.

C1—5 to 15 inches; dark grayish brown (10YR 4/2) silt loam; few fine prominent brown (7.5YR 4/4) mottles; massive; friable; many thin strata of pale brown (10YR 6/3) and yellowish brown (10YR 5/4) silt loam; neutral; clear wavy boundary.

C2—15 to 29 inches; dark grayish brown (10YR 4/2) silt loam; few fine prominent brown (7.5YR 4/4) mottles; massive; friable; many thin strata of brown (10YR 4/4), yellowish brown (10YR 5/6), and pale brown (10YR 6/3) silt loam; few very dark gray (10YR 3/1) wormcasts; neutral; abrupt wavy boundary.

Ab1—29 to 39 inches; black (N 2/0) silt loam; weak thick platy structure parting to weak medium and fine subangular blocky; friable; neutral; clear smooth boundary.

Ab2—39 to 51 inches; black (N 2/0) silty clay loam; strong medium and fine angular blocky structure; friable; neutral; clear smooth boundary.

Ab3—51 to 60 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium and fine subangular blocky structure; friable; neutral.

Depth to the dark buried soil ranges from 20 to 40 inches. The thickness of the surface layer ranges from 5 to 10 inches.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The C horizon also has value of 4 or 5 and chroma of 2 or 3. The Ab horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. In some pedons it has mottles with higher chroma.

Otter Series

The Otter series consists of deep, poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Otter soils are similar to Sawmill soils and are commonly adjacent to Elvers, Lawson, and Orion soils. Lawson and Orion soils are in the slightly higher positions on the flood plains and are not subject to ponding. Lawson soils are somewhat poorly drained. Orion soils are somewhat poorly drained and have light-colored, silty, stratified sediments over a buried soil. Sawmill soils contain more clay in the control section than the Otter soils. They are in landscape positions similar to those of the Otter soils. Elvers soils have light-colored, silty, stratified sediments overlying organic deposits. They are in landscape positions similar to those of the Otter soils.

Typical pedon of Otter silt loam, frequently flooded, 1,960 feet west and 2,540 feet south of the northeast corner of sec. 35, T. 22 N., R. 5 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

A1—10 to 16 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; slightly acid; clear smooth boundary.

A2—16 to 21 inches; black (N 2/0) silt loam, very dark gray (10YR 3/1) dry; few fine distinct grayish brown (2.5Y 5/2) and few fine prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure parting to moderate medium granular; friable; few fine stains of iron oxide; slightly acid; clear smooth boundary.

A3—21 to 35 inches; black (N 2/0) mucky silt loam, black (N 2/0) dry; few fine prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

AB—35 to 43 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; common medium faint dark gray (10YR 4/1) and few fine prominent brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; few fine stains of iron oxide; neutral; clear smooth boundary.

Bg—43 to 50 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and few medium prominent brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; few distinct very dark grayish brown (10YR 3/2) organic films in root channels; neutral; clear smooth boundary.

Cg—50 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the solum ranges from 36 to 50 inches. The thickness of the mollic epipedon ranges from 30 to 45 inches.

The A horizon is neutral in hue and has value of 2 or 3 and chroma of 0 to 2. It ranges from slightly acid to mildly alkaline. The Bg and Cg horizons are neutral in hue and have value of 4 to 6 and chroma of 0 to 4. They range from slightly acid to moderately alkaline. In some pedons the Cg horizon has strata of silty clay loam, loam, or sandy loam.

Palms Series

The Palms series consists of deep, very poorly drained soils on flood plains. These soils formed in herbaceous organic deposits over silty alluvium. Permeability is moderately slow to moderately rapid in the organic material and moderate in the underlying silty material. Slopes range from 0 to 2 percent.

Palms soils are similar to Houghton soils and are commonly adjacent to Blackoar and Houghton soils. Blackoar soils are poorly drained and are in the slightly higher positions on the flood plains. They formed entirely in silty alluvium. Houghton soils have organic deposits extending to a depth of more than 51 inches. They are in landscape positions similar to those of the Palms soils.

Typical pedon of Palms muck, rarely flooded, 2,040 feet east and 140 feet south of the northwest corner of sec. 6, T. 21 N., R. 4 E.

Oap—0 to 10 inches; sapric material, black (N 2/0) broken face and rubbed; less than 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

Oa—10 to 28 inches; sapric material, black (5YR 2.5/1) broken face and black (10YR 2/1) rubbed; about 10 percent fiber, 5 percent rubbed; weak medium platy structure; friable; few thin strata of very dark gray (10YR 3/1) silt loam that has few fine distinct dark yellowish brown (10YR 4/4) mottles; few fine iron stains; neutral; clear smooth boundary.

2Cg1—28 to 36 inches; very dark gray (10YR 3/1) mucky silt loam; few fine prominent olive brown (2.5YR 4/4) mottles; massive; friable; neutral; clear smooth boundary.

2Cg2—36 to 41 inches; gray (5Y 5/1) silt loam; common prominent light olive brown (2.5Y 5/4), few fine prominent brown (7.5YR 5/4), and few fine prominent reddish brown (5YR 5/3) mottles; massive; friable; very dark gray (10YR 3/1) krotovinas; neutral; clear smooth boundary.

2Cg3—41 to 60 inches; gray (5Y 5/1) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline.

The depth to the silty 2Cg horizon ranges from 16 to 50 inches. Some organic layers contain free carbonates. Some pedons have a thin layer of sedimentary peat above the 2Cg horizon.

Pecatonica Series

The Pecatonica series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and glacial till. Slopes range from 5 to 10 percent.

Pecatonica soils are similar to Ogle soils and are commonly adjacent to Lamont, Ogle, Tell, and Woodbine soils. Lamont, Tell, and Woodbine soils are downslope from the Pecatonica soils. Lamont soils contain more sand throughout than the Pecatonica soils. Tell soils formed in loess over sandy material. Ogle soils have a mollic epipedon and a thicker layer of loess than the Pecatonica soils. They are on the broader ridges farther from the drainageways than the Pecatonica soils. Woodbine soils have limestone bedrock within a depth of 60 inches.

Typical pedon of Pecatonica silt loam, 5 to 10 percent slopes, eroded, 2,140 feet east and 1,760 feet north of the southwest corner of sec. 1, T. 22 N., R. 4 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 63) dry; weak medium subangular blocky structure parting to weak medium granular; friable; few yellowish brown (10YR 5/4) fragments of subsoil material; common faint dark brown (10YR 3/3) organic films on faces of peds; neutral; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; few faint brown (10YR 4/3) organic films on faces of peds; few faint dark brown (10YR 3/3) organic films in root channels; medium acid; clear smooth boundary.

Bt2—13 to 19 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.

2Bt3—19 to 23 inches; strong brown (7.5YR 5/6) loam; moderate medium and fine subangular blocky structure; friable; common distinct brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt4—23 to 29 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few prominent reddish brown (5YR

4/4) clay films on faces of peds; few chert fragments and igneous pebbles; medium acid; clear smooth boundary.

2Bt5—29 to 44 inches; yellowish red (5YR 4/6) clay loam; moderate coarse subangular blocky structure; firm; few distinct reddish brown (5YR 4/4) clay films on faces of peds; few chert fragments and igneous pebbles; medium acid; clear smooth boundary.

2Bt6—44 to 60 inches; yellowish red (5YR 4/6) clay loam; weak coarse subangular blocky structure; firm; few distinct reddish brown (5YR 4/4) clay films on faces of peds; few chert fragments and igneous pebbles; pocket of gravelly sandy loam at a depth of 56 inches; medium acid.

The solum commonly is more than 60 inches thick. The thickness of the loess ranges from 15 to 25 inches.

The Ap horizon has chroma of 2 or 3. The 2Bt horizon has chroma of 4 to 6. It is clay loam, loam, or sandy clay loam.

Pella Series

The Pella series consists of deep, poorly drained soils on outwash plains that are subject to flooding. These soils formed in silty material over stratified loamy outwash. Permeability is moderate in the solum and moderately rapid in the substratum. Slopes range from 0 to 2 percent.

Pella soils are similar to Selma soils and are commonly adjacent to Gilford and Selma soils. Gilford and Selma soils are in landscape positions similar to those of the Pella soils. Gilford soils are very poorly drained. They formed in loamy and sandy material and do not have free carbonates. Selma soils are deeper to free carbonates than the Pella soils and are fine-loamy.

Typical pedon of Pella silty clay loam, occasionally flooded, 2,300 feet west and 1,040 feet south of the northeast corner of sec. 12, T. 19 N., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; neutral; abrupt smooth boundary.

A—9 to 14 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; few fine prominent light brownish gray (2.5Y 6/2) mottles; moderate medium and fine angular blocky structure; friable; neutral; abrupt smooth boundary.

Bg1—14 to 26 inches; dark gray (5Y 4/1) silty clay loam; many fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; friable; common prominent very dark gray (10YR 3/1) organic films on faces of peds; neutral; abrupt wavy boundary.

Bg2—26 to 33 inches; gray (10YR 5/1) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; black (10YR 2/1) krotovinas at a depth of 27 to 30 inches; neutral; abrupt wavy boundary.

Bg3—33 to 40 inches; gray (10YR 5/1) silty clay loam; few medium prominent strong brown (7.5YR 5/8) and few fine prominent light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; slight effervescence; mildly alkaline; abrupt wavy boundary.

Bg4—40 to 50 inches; mottled light olive brown (2.5Y 5/6), grayish brown (2.5Y 5/2), and olive (5Y 5/3) silty clay loam; moderate medium subangular blocky structure; friable; strong effervescence; mildly alkaline; abrupt wavy boundary.

2Cg—50 to 60 inches; stratified yellowish brown (10YR 5/4) loamy sand and olive gray (5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; massive; friable; black (10YR 2/1) krotovinas at a depth of 58 inches; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 32 to 50 inches. The depth to free carbonates ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon is neutral in hue and has value of 2 or 3 and chroma of 0 to 2. It is silty clay loam or silt loam. The Bg horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. In some pedons it has individual subhorizons that are clay loam or silty clay. The 2Cg horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 to 8. It is stratified silt loam, silty clay loam, loam, sandy loam, loamy sand, or sand.

Plainfield Series

The Plainfield series consists of deep, excessively drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in wind- and water-deposited sandy material. Slopes range from 3 to 25 percent.

Plainfield soils are similar to Dickinson and Sparta soils and are commonly adjacent to Dickinson, Orio, Sparta, and Udolpho soils. Dickinson soils are well drained and somewhat excessively drained and are in landscape positions similar to those of the Plainfield soils. They contain more silt and clay in the solum than the Plainfield soils and have a mollic epipedon. Udolpho and Orio soils have a thin dark surface layer and contain more silt and clay in the solum than the Plainfield soils. Udolpho soils are poorly drained and are lower on the landscape than the Plainfield soils. Orio soils are poorly drained and are in depressions. Sparta soils have a mollic epipedon. They are in landscape positions similar to those of the Plainfield soils.

Typical pedon of Plainfield sand, 3 to 12 percent slopes, 40 feet north and 2,010 feet west of the southeast corner of sec. 34, T. 22 N., R. 3 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

Bw—4 to 14 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; slightly acid; gradual smooth boundary.

BC—14 to 26 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid; gradual smooth boundary.

C—26 to 60 inches; strong brown (7.5YR 5/6) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 40 inches. The thickness of the surface soil ranges from 4 to 10 inches.

The Ap horizon, if it occurs, has value of 3 or 4 and chroma of 2 or 3. The A horizon has value of 2 or 3 and chroma of 1 to 3. The Ap or A horizon is loamy sand, fine sand, or sand. The Bw and BC horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. They range from very strongly acid to slightly acid. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6.

Port Byron Series

The Port Byron series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 1 to 10 percent.

Port Byron soils are similar to Mt. Carroll and Tama soils and are commonly adjacent to Joy and Mt. Carroll soils. Joy soils are somewhat poorly drained and are in the less sloping, lower positions. Tama and Mt. Carroll soils are in landscape positions similar to those of the Port Byron soils. Tama soils contain more clay in the subsoil than the Port Byron soils. Mt. Carroll soils have a thinner dark surface layer than the Port Byron soils.

Typical pedon of Port Byron silt loam, 2 to 5 percent slopes, 2,620 feet south and 400 feet east of the northwest corner of sec. 9, T. 20 N., R. 3 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; medium acid; abrupt smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine subangular blocky structure; friable; many faint very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear smooth boundary.

BA—15 to 20 inches; brown (10YR 4/3) silt loam; moderate medium and fine subangular blocky structure; friable; many faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few faint very dark grayish brown (10YR 3/2) wormcasts; slightly acid; clear smooth boundary.

Bw1—20 to 31 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few faint dark brown (10YR 3/3) wormcasts; medium acid; clear smooth boundary.

Bw2—31 to 40 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bw3—40 to 52 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

BC—52 to 60 inches; yellowish brown (10YR 5/4) silt loam; common fine faint yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine stains of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 42 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 4 or 5 and chroma of 3 to 5. It has a B/A clay ratio of less than 1.2. Some pedons are sand, loamy sand, fine sand, or loamy fine sand within a depth of 60 inches.

Prophetstown Series

The Prophetstown series consists of deep, poorly drained, moderately permeable soils on outwash plains and upland till plains. These soils formed in calcareous, silty material over stratified loamy outwash. Slopes range from 0 to 2 percent.

Prophetstown soils are similar to Canisteo soils and are commonly adjacent to Drummer soils and Joy soils that have a sandy substratum. Drummer and Canisteo soils are in landscape positions similar to those of the Prophetstown soils. Canisteo soils have more sand throughout than the Prophetstown soils. Drummer soils do not have free carbonates within a depth of 40 inches and contain more clay in the control section than the Prophetstown soils. Joy soils are somewhat poorly drained and are slightly higher on the landscape than the Prophetstown soils. They contain more sand within a depth of 60 inches than the Prophetstown soils and do not have free carbonates in the profile.

Typical pedon of Prophetstown silt loam, 1,820 feet east and 520 feet south of the northwest corner of sec. 33, T. 19 N., R. 6 E.

Apk—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; violent effervescence; mildly alkaline; abrupt smooth boundary.

Ak—9 to 16 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; common fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; common faint black (10YR 2/1) organic films on faces of peds; violent effervescence; mildly alkaline; clear smooth boundary.

Bkg1—16 to 23 inches; dark grayish brown (2.5Y 4/2) silt loam; many fine distinct light olive brown (2.5Y 5/4) mottles; weak medium and fine subangular blocky structure; friable; many distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; common fine accumulations of iron and manganese oxide; slight effervescence; mildly alkaline; clear smooth boundary.

Bkg2—23 to 33 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; common prominent very dark grayish brown (10YR 3/2) organic films on faces of peds; dark gray (10YR 4/1) krotovinas; common fine accumulations of iron and manganese oxide; common fine rounded concretions of calcium carbonate; strong effervescence; mildly alkaline; gradual smooth boundary.

BCg—33 to 40 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; friable; dark gray (10YR 4/1) krotovinas; common fine accumulations of iron and manganese oxide; common fine rounded concretions of calcium carbonate; strong effervescence; mildly alkaline; gradual smooth boundary.

Cg1—40 to 52 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; common fine accumulations of iron and manganese oxide; common fine rounded concretions of calcium carbonate; strong effervescence; mildly alkaline; abrupt smooth boundary.

2Cg2—52 to 60 inches; light gray (10YR 6/1), stratified loam, sandy loam, and silt loam; many fine prominent yellowish brown (10YR 5/8) mottles; massive; friable; few faint dark gray (10YR 4/1) linings in root channels; very dark gray (10YR 3/1) vertical krotovinas; common fine accumulations of iron and manganese oxide; common fine rounded concretions of calcium carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 28 to 48 inches. Reaction is mildly alkaline or moderately alkaline throughout the profile. Some pedons contain small snail shells in part or all of the solum. Depth to the loamy outwash material is generally less than 60 inches. The thickness of the mollic epipedon ranges from 10 to 23 inches.

The Apk and Ak horizons have hue of 2.5Y, value of 2 or 3, and chroma of 1 or 2. The Bkg horizon has hue of 10YR or 5Y or is neutral in hue. It has value of 4 to 7 and chroma of 0 to 2. The Cg horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 to 7, and chroma of 1 or 2. It typically is mottled. The 2Cg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It is stratified with dominantly loamy textures. Textures include loam, silt loam, sandy loam, loamy sand, and sand.

Raddle Series

The Raddle series consists of deep, well drained, moderately permeable soils on foot slopes and stream terraces. These soils formed in silty alluvium. Slopes range from 0 to 5 percent.

Raddle soils are similar to Port Byron and Seaton soils and are commonly adjacent to Littleton and Seaton soils. Littleton soils are somewhat poorly drained and are lower on the landscape than the Raddle soils. They have a mollic epipedon that is more than 24 inches thick. Port Byron soils are on uplands. Seaton soils have an ochric epipedon. They are on uplands.

Typical pedon of Raddle silt loam, 0 to 2 percent slopes, 1,780 feet west and 2,020 feet north of the southeast corner of sec. 23, T. 19 N., R. 4 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

A1—10 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; many faint very dark gray (10YR 3/1) organic coatings on faces of peds; medium acid; clear smooth boundary.

A2—16 to 21 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; medium acid; clear smooth boundary.

BA—21 to 26 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common faint dark brown (10YR 3/3) organic films on faces of peds; medium acid; clear smooth boundary.

Bt1—26 to 34 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—34 to 51 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; few faint brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

BC—51 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; few fine stains of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 50 to 70 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches. Reaction ranges from medium acid to neutral in the solum.

The A horizon has value of 2 or 3 and chroma of 1 to 3. Some pedons have an AB horizon instead of a BA horizon. The Bt horizon has hue of 7.5YR, value of 3 to 5, and chroma of 3 or 4. It has a B/A clay ratio of less than 1.2.

Richwood Series

The Richwood series consists of deep, well drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy, stratified sediments. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 2 to 10 percent.

Richwood soils are similar to Port Byron soils and are commonly adjacent to Drummer and Elburn soils. Port Byron soils contain less sand in the lower part of the subsoil and the substratum than the Richwood soils. They are on uplands. Drummer soils are poorly drained and are in nearly level, broad, low areas and in slight depressions. Elburn soils are somewhat poorly drained and are in the slightly lower, nearly level areas.

Typical pedon of Richwood silt loam, 2 to 5 percent slopes, 520 feet east and 2,140 feet south of the northwest corner of sec. 2, T. 21 N., R. 4 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak medium granular; friable; slightly acid; abrupt smooth boundary.

A1—6 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine subangular blocky structure; friable; common faint very dark gray (10YR 3/1) organic films on faces of peds; slightly acid; clear smooth boundary.

A2—13 to 18 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium and fine subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; abrupt smooth boundary.

Bt1—18 to 29 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint dark brown (10YR 3/3) organic films on faces of peds; few distinct very dark grayish brown (10YR 3/2) organic coatings along root channels; common faint brown (10YR 4/3) clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—29 to 46 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) and brown (10YR 5/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—46 to 60 inches; strong brown (7.5YR 5/6), stratified fine sandy loam and loamy sand; few fine prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few prominent brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid.

The thickness of the solum ranges from 50 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches. Depth to the loamy, stratified sediments ranges from 40 to 55 inches. Reaction ranges from medium acid to neutral in the solum.

The 2Bt or 2BC horizon is stratified silt loam, loam, fine sandy loam, or sandy loam. It typically has thin strata of loamy sand or sand.

Richwood silt loam, 5 to 10 percent slopes, eroded, has a thinner dark surface layer than is definitive for the series. This difference, however, does not affect the use or behavior of the soil.

Riley Series

The Riley series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in loamy sediments over sandy alluvium. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Riley soils are similar to Medway soils and are commonly adjacent to Ambraw, Beaucoup, and Zumbro soils. Ambraw and Beaucoup soils are poorly drained and are in the slightly lower positions that are subject to ponding. Ambraw soils contain more clay and less sand in the lower part of the control section than the Riley soils. Beaucoup soils formed in silty alluvium. Zumbro soils are well drained and are slightly higher on the landscape than the Riley soils. They contain more sand in the solum than the Riley soils. Medway soils are moderately well drained and are in landscape positions similar to those of the Riley soils. They contain more clay and less sand in the lower part of the control section than the Riley soils.

Typical pedon of Riley loam, frequently flooded, 2,540 feet north and 120 feet east of the southwest corner of sec. 34, T. 20 N., R. 4 E.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; abrupt smooth boundary.

A—8 to 17 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure parting to moderate fine granular; friable; few fine rounded stains and concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bw1—17 to 27 inches; brown (10YR 4/3) clay loam; common fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) organic films on faces of peds; few fine rounded concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bw2—27 to 34 inches; brown (10YR 4/3) sandy clay loam; common fine faint dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine rounded concretions of iron and manganese oxide; neutral; abrupt smooth boundary.

2C1—34 to 39 inches; stratified dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) loamy sand; massive; very friable; neutral; abrupt smooth boundary.

2C2—39 to 60 inches; yellowish brown (10YR 5/4) sand; few fine and medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 18 to 36 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 Bw horizon has value of 4 to 6 and chroma of 2 to 4. In this horizon either the matrix or mottles have chroma of 2. The A and Bw horizons are sandy clay loam, clay loam, or loam. The 2C horizon is loamy fine sand, loamy sand, or sand. In some pedons it has thin strata of sandy loam, loam, loamy coarse sand, or coarse sand.

Ross Series

The Ross series consists of deep, well drained soils on flood plains and low stream terraces. These soils formed in loamy alluvium. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

The Ross soils in this survey area are taxadjuncts because they have a thinner dark surface soil than is defined as the range for the series. This difference, however, does not affect the use or behavior of the soils.

Ross soils are similar to Huntsville soils and are commonly adjacent to Ambraw, Du Page, and Medway soils. Ambraw soils are poorly drained and are lower on the landscape than the Ross soils. They have a thinner dark surface soil than the Ross soils. The moderately well drained Du Page soils are in the slightly lower positions and are closer to the stream channel than the Ross soils. They are calcareous throughout. Huntsville soils contain less sand in the control section than the Ross soils. They are closer to the stream channel than the Ross soils. Medway soils are moderately well drained and are slightly lower on the landscape than the Ross soils. They have a thinner dark surface soil than the Ross soils.

Typical pedon of Ross loam, rarely flooded, 2,500 feet west and 160 feet north of the southeast corner of sec. 24, T. 19 N., R. 3 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

A—11 to 16 inches; dark brown (10YR 3/3) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; many faint very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bw1—16 to 22 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; few distinct very dark gray (10YR 3/1) wormcasts; neutral; clear smooth boundary.

Bw2—22 to 31 inches; brown (10YR 4/3) loam; weak medium and coarse subangular blocky structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; neutral; clear smooth boundary.

Bw3—31 to 41 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; few faint dark brown (10YR 3/3) organic films on faces of peds; neutral; abrupt smooth boundary.

Bw4—41 to 50 inches; very dark grayish brown (10YR 3/2) sandy loam; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

C—50 to 60 inches; brown (7.5YR 4/4) sandy loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; friable; few prominent very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral.

In some pedons free carbonates are in the lower part of the solum and in the substratum.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is loam or silt loam. The Bw horizon is loam, silt loam, sandy loam, or silty clay loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy clay loam, loam, sandy loam, or the gravelly analogs of these textures.

Rozetta Series

The Rozetta series consists of deep, moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 10 percent.

Rozetta soils are similar to and are commonly adjacent to Downs and Fayette soils. Downs soils have a darker surface layer than the Rozetta soils. They are in landscape positions similar to those of the Rozetta soils. Fayette soils are well drained and are on side slopes and on the narrower ridges.

Typical pedon of Rozetta silt loam, 2 to 5 percent slopes, 320 feet east and 2,020 feet north of the southwest corner of sec. 15, T. 22 N., R. 7 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—9 to 13 inches; brown (10YR 5/3) and dark grayish brown (10YR 4/2) silt loam; weak medium and thin platy structure parting to moderate fine subangular blocky; friable; neutral; clear smooth boundary.

Bt1—13 to 22 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; many faint brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt3—31 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky and angular blocky structure; friable; common faint brown (10YR 5/3) and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine manganese stains; strongly acid; clear smooth boundary.

Bt4—37 to 49 inches; brown (10YR 5/3) silt loam; few fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; few faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine manganese stains; strongly acid; gradual smooth boundary.

C—49 to 60 inches; brown (10YR 5/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; massive; friable; few faint dark grayish brown (10YR 4/2) clay films lining root channels; few fine manganese stains; medium acid.

The thickness of the solum ranges from 45 to 60 inches.

The Ap and E horizons have value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. The C horizon has value of 5 or 6 and chroma of 2 to 6.

Sable Series

The Sable series consists of deep, poorly drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Sable soils are similar to Drummer soils and are commonly adjacent to Joy soils. Drummer soils have more sand in the lower part of the profile than the Sable soils. They are in landscape positions similar to those of the Sable soils. Joy soils are somewhat poorly drained and are in slightly higher positions than the Sable soils. They contain less clay in the subsoil than the Sable soils.

Typical pedon of Sable silt loam, 660 feet west and 1,600 feet north of the southeast corner of sec. 9, T. 21 N., R. 4 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A—8 to 15 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; neutral; clear smooth boundary.

AB—15 to 20 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; neutral; clear smooth boundary.

Bg—20 to 28 inches; dark gray (5Y 4/1) silty clay loam; few fine prominent yellowish brown (10YR 5/4) and few fine distinct grayish brown (2.5Y 5/2) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; friable; common prominent very dark gray (10YR 3/1) organic films on faces of peds; mildly alkaline; clear smooth boundary.

Btg1—28 to 35 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct dark gray (5Y 4/1) clay films on faces of peds; few distinct very dark gray (10YR 3/1) organic films on faces of peds; mildly alkaline; clear smooth boundary.

Btg2—35 to 47 inches; olive gray (5Y 5/2) silt loam; many fine prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few faint dark gray (5Y 4/1) clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Cg—47 to 60 inches; gray (5Y 5/1) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; mildly alkaline.

The thickness of the solum ranges from 40 to 55 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon is neutral in hue and has value of 2 or 3 and chroma of 0 or 1. The Bg or Btg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2.

Sawmill Series

The Sawmill series consists of deep, poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Sawmill soils are similar to Ambraw and Beaucoup soils and are commonly adjacent to Ambraw, Orion, and Wakeland soils. Ambraw and Beaucoup soils are in landscape positions similar to those of the Sawmill soils. Orion and Wakeland soils are in the slightly higher positions on the flood plains. Ambraw soils have a thinner dark surface soil than the Sawmill soils and contain more sand in the control section. Beaucoup soils have a thinner dark surface soil than the Sawmill soils. Orion soils are somewhat poorly drained. They have light-colored, silty, stratified sediments over a dark buried soil. Wakeland soils are somewhat poorly drained. They formed in light-colored, silty, stratified sediments.

Typical pedon of Sawmill silty clay loam, frequently flooded, 1,180 feet east and 2,580 feet north of the southwest corner of sec. 27, T. 20 N., R. 4 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; neutral; clear smooth boundary.

A1—8 to 15 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure parting to moderate fine granular; friable; many faint black (10YR 2/1) organic films on faces of peds; neutral; clear smooth boundary.

A2—15 to 22 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure; firm; many faint black (10YR 2/1) organic films on faces of peds; neutral; clear smooth boundary.

A3—22 to 29 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine distinct dark yellowish brown (10YR 3/4) mottles; moderate medium subangular blocky structure; firm; many faint black (10YR 2/1) organic films on faces of peds; few fine concretions of iron oxide; neutral; clear smooth boundary.

Bg—29 to 34 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent strong brown (7.5YR 4/6) and few fine distinct brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common faint very dark gray (10YR 3/1) organic films on faces of peds; few fine concretions of iron oxide; neutral; clear smooth boundary.

Btg—34 to 48 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine prismatic structure parting to weak medium subangular blocky; friable; few distinct very dark gray (10YR 3/1) organic films in root channels; few distinct dark gray (10YR 4/1) clay films on faces of peds; very dark gray (10YR 3/1) bands of silty clay loam krotovinas 2 to 3 inches wide at depths of 40, 43, and 46 inches; few fine concretions of iron and manganese oxide; neutral; clear smooth boundary.

BCg—48 to 60 inches; gray (5Y 5/1), stratified clay loam, silty clay loam, and sandy loam; common medium prominent strong brown (7.5YR 4/6) and common fine prominent brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to weak coarse subangular blocky; friable; few prominent dark gray (10YR 4/1) clay films on faces of peds; neutral.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches. In some pedons the mollic epipedon is buried under 10 to 20 inches of light-colored silt loam overwash.

The Ap horizon has hue of 2.5Y or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It ranges from slightly acid to mildly alkaline. The Bg or Btg horizon is silty clay loam or silt loam. The BCg horizon typically is stratified silty clay loam, silt loam, loam, clay loam, or sandy loam.

Seaton Series

The Seaton series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 35 percent.

Seaton soils are similar to Fayette, Mt. Carroll, and Timula soils and are commonly adjacent to Mt. Carroll and Timula soils. Fayette soils contain more clay in the control section than the Seaton soils. They are in landscape positions similar to those of the Seaton soils. Timula soils contain less clay in the control section than the Seaton soils and have free carbonates within a depth of 36 inches. They are on more convex slopes than the Seaton soils. Mt. Carroll soils have a thin dark surface layer. They are in landscape positions similar to those of the Seaton soils.

Typical pedon of Seaton silt loam, 2 to 5 percent slopes, 1,160 feet west and 520 feet south of the northeast corner of sec. 34, T. 22 N., R. 4 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; slightly acid; abrupt smooth boundary.

Bt1—9 to 17 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—17 to 26 inches; brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds; common dark brown (10YR 3/3) wormcasts; medium acid; clear smooth boundary.

Bt3—26 to 40 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; many faint brown (10YR 4/3) clay films on faces of peds; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt4—40 to 49 inches; yellowish brown (10YR 5/4) silt loam; moderate medium prismatic structure parting to weak medium subangular blocky; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

BC—49 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; medium acid.

The thickness of the solum ranges from 38 to more than 60 inches. The thickness of the surface layer ranges from 3 to 12 inches.

The A or Ap horizon has value of 4 or 5 and chroma of 2 to 4. Some pedons have an E horizon, which has value of 4 or 5 and chroma of 2 to 4. The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. In some pedons it has relict mottles in the lower part.

Selma Series

The Selma series consists of deep, poorly drained soils on outwash plains that are subject to flooding. These soils formed in loamy sediments over stratified loamy outwash. Permeability is moderate in the solum and moderately rapid in the substratum. Slopes range from 0 to 2 percent.

Selma soils are similar to and are commonly adjacent to Gilford and Pella soils. Gilford soils are very poorly drained and are in landscape positions similar to those of the Selma soils. They contain more sand and less clay in the solum than the Selma soils. Pella soils contain less sand in the solum than the Selma soils and are calcareous within a depth of 40 inches. They are in landscape positions similar to those of the Selma soils.

Typical pedon of Selma loam, occasionally flooded, 110 feet north and 1,000 feet east of the southwest corner of sec. 29, T. 19 N., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—9 to 16 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure; friable; neutral; clear smooth boundary.

AB—16 to 22 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; few fine prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; neutral; clear smooth boundary.

Bg1—22 to 28 inches; dark gray (5Y 4/1) loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; very dark gray (10YR 3/1) krotovinas 2 inches wide at a depth of 26 inches; few fine concretions of iron and manganese oxide; neutral; clear wavy boundary.

Bg2—28 to 34 inches; gray (5Y 5/1) loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine concretions of iron and manganese oxide; neutral; clear wavy boundary.

BCg—34 to 45 inches; light olive gray (5Y 6/2) and dark gray (10YR 4/1) loam; few fine prominent strong brown (7.5YR 4/6) mottles; weak coarse and medium prismatic structure; friable; very dark gray (10YR 3/1) krotovinas 1 inch wide at a depth of 39 inches; mildly alkaline; abrupt smooth boundary.

Cg—45 to 60 inches; stratified light brownish gray (2.5Y 6/2) loamy sand and sandy loam and pale olive (5Y 6/3) loam; few fine distinct light olive brown (2.5Y 5/4) mottles; massive; very friable; mildly alkaline.

The thickness of the solum ranges from 40 to 55 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 or 3. It is loam or clay loam. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is loam, clay loam, silty clay loam, or silt loam. In some pedons the lower part of the Bg horizon or the BCg horizon is sandy loam or sandy clay loam. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It commonly is mottled. It is stratified silt loam, loam, loamy sand, sandy loam, or sand.

Sparta Series

The Sparta series consists of deep, excessively drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in wind- and water-deposited sandy material. Slopes range from 0 to 20 percent.

Sparta soils are similar to Dickinson and Plainfield soils and are commonly adjacent to Dickinson, Orio, and Udolpho soils. Plainfield soils have an ochric epipedon. They are in landscape positions similar to those of the Sparta soils. Dickinson soils are well drained and somewhat excessively drained and are in landscape positions similar to those of the Sparta soils. They contain more silt and clay in the solum than the Sparta soils. Udolpho soils are poorly drained and are lower on the landscape than the Sparta soils. They contain more clay in the profile than the Sparta soils and have a thin dark surface layer. Orio soils are poorly drained and are in depressions that are subject to ponding. They have a thin dark surface layer and contain more clay in the solum than the Sparta soils.

Typical pedon of Sparta loamy sand, 0 to 3 percent slopes, 260 feet south and 2,190 feet west of the northeast corner of sec. 14, T. 19 N., R. 4 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; medium acid; abrupt smooth boundary.

A—6 to 18 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

Bw1—18 to 25 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common faint dark brown (10YR 3/3) organic coatings on faces of peds; medium acid; clear smooth boundary.

Bw2—25 to 38 inches; yellowish brown (10YR 5/4) loamy sand; moderate medium subangular blocky structure; very friable; strongly acid; clear smooth boundary.

C—38 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; bands of strong brown (7.5YR 4/4) loamy sand 2 inches thick at depths of 46 and 53 inches; strongly acid.

The thickness of the solum ranges from 28 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3. It is sand, loamy sand, fine sand, or loamy fine sand. Some pedons have an AB horizon. The Bw horizon has hue of 10YR or 7.5YR and chroma of 4 to 6. It is fine sand, loamy sand, or sand.

Tama Series

The Tama series consists of deep, moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 10 percent.

Tama soils are similar to and are commonly adjacent to Downs and Muscatine soils. Downs soils have a thinner dark surface soil than the Tama soils. They are in positions similar to those of the Tama soils. Muscatine soils are somewhat poorly drained and are in the less sloping or slightly lower positions.

Typical pedon of Tama silt loam, 2 to 5 percent slopes, 1,920 feet south and 480 feet west of the northeast corner of sec. 26, T. 22 N., R. 6 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; many faint black (10YR 2/1) organic films on faces of peds; slightly acid; abrupt smooth boundary.

BA—13 to 18 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure parting to moderate medium granular; friable; few distinct black (10YR 2/1) organic films on faces of peds; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; slightly acid; clear smooth boundary.

Bt1—18 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; few distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; common faint brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 35 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; few distinct very dark brown (10YR 2/2) organic fillings in root channels; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt3—35 to 44 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine manganese stains; medium acid; clear smooth boundary.

Bt4—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; many fine distinct yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure; friable; few faint brown (10YR 5/3) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine manganese stains; slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3. The Bt horizon has chroma of 3 or 4.

Tama silt loam, 5 to 10 percent slopes, eroded, has a thinner dark surface soil than is definitive for the series. This difference, however, does not affect the use or behavior of the soil.

Tell Series

The Tell series consists of deep, well drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying outwash. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 2 to 15 percent.

Tell soils are similar to Waukegan soils and are commonly adjacent to Joy, Oakville, and Raddle soils. Joy soils are somewhat poorly drained and are in the nearly level, lower positions. They have a mollic epipedon and are deeper over sandy outwash than the Tell soils. Oakville, Raddle, and Waukegan soils are in landscape positions similar to those of the Tell soils. Oakville soils contain more sand in the solum than the Tell soils. Raddle and Waukegan soils have a mollic epipedon. Raddle soils contain more silt and clay in the lower part of the subsoil and in the substratum than the Tell soils.

Typical pedon of Tell silt loam, in an area of Oakville-Tell complex, 4 to 10 percent slopes, eroded; 620 feet east and 1,480 feet north of the southwest corner of sec. 25, T. 19 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; few yellowish brown (10YR 5/4) fragments of subsoil material; slightly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—13 to 23 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; abrupt wavy boundary.

2Bt3—23 to 27 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; abrupt wavy boundary.

2BC—27 to 34 inches; yellowish brown (10YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; few distinct dark yellowish brown (10YR 4/4) clay coatings between sand grains; slightly acid; clear smooth boundary.

2C1—34 to 42 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; slightly acid; gradual smooth boundary.

2C2—42 to 60 inches; yellowish brown (10YR 5/4) fine sand stratified with thin lenses of dark yellowish brown (10YR 4/4) and light yellowish brown (10YR 6/4) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 24 to 44 inches. The thickness of the loess ranges from 20 to 36 inches. The thickness of the surface soil ranges from 5 to 12 inches.

The Ap horizon has value and chroma of 3 or 4. The BE horizon, if it occurs, has value of 4 or 5 and chroma of 3 or 4. The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. It ranges from neutral to strongly acid. The 2Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loam. Some pedons do not have a 2BC horizon. The 2Bt and 2BC horizons range from neutral to strongly acid.

Tell silt loam, 2 to 5 percent slopes, Tell silt loam, 5 to 10 percent slopes, eroded, and Tell silt loam, 10 to 15 percent slopes, eroded, do not have the contrasting particle-size class within the control section that is definitive for the series. This difference, however, does not affect the use or behavior of the soils.

Thorp Series

The Thorp series consists of deep, poorly drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying stratified loamy outwash. Permeability is slow in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Thorp soils are similar to Orio soils and are commonly adjacent to Drummer, Elburn, and Virgil soils. Orio soils contain more sand in the solum than the Thorp soils. They are in landscape positions similar to those of the Thorp soils. Elburn and Virgil soils are somewhat poorly drained and are slightly higher on the landscape than the Thorp soils. They are moderately permeable in the upper part of the profile. Elburn soils do not have an E horizon. Virgil soils have a thinner dark surface layer than the Thorp soils. Drummer soils are moderately permeable in the upper part and do not have an E horizon. They are in landscape positions similar to those of the Thorp soils.

Typical pedon of Thorp silt loam, 1,640 feet south and 320 feet west of the northeast corner of sec. 35, T. 19 N., R. 5 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; medium acid; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; medium acid; abrupt wavy boundary.

Eg—14 to 19 inches; dark gray (10YR 4/1) silt loam; few fine prominent brown (7.5YR 4/4) mottles; weak medium platy structure; friable; few faint very dark gray (10YR 3/1) organic films on faces of peds; medium acid; abrupt wavy boundary.

Btg1—19 to 24 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent brown (7.5YR 4/4) and yellowish brown (10YR 5/6) and few fine faint gray (10YR 5/1) mottles; moderate medium prismatic structure parting to moderate medium and fine angular blocky; friable; many faint very dark gray (10YR 3/1) organic clay films on faces of peds; medium acid; clear smooth boundary.

Btg2—24 to 37 inches; gray (5Y 5/1) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; few prominent dark gray (10YR 4/1) clay films on faces of peds; common distinct very dark grayish brown (2.5Y 3/2) organic films along root channels; slightly acid; abrupt wavy boundary.

2BCg—37 to 44 inches; dark gray (10YR 4/1) sandy loam that has thin strata of gray (5Y 6/1) loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slightly acid; abrupt wavy boundary.

2Cg—44 to 60 inches; stratified dark gray (10YR 4/1) sandy loam, grayish brown (10YR 5/2) loamy sand, and gray (5Y 6/1) loam; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very friable; slightly acid.

The thickness of the solum ranges from 40 to 65 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 to 3. The Eg horizon is 4 to 10 inches thick. It has hue of 2.5Y, value of 4 to 6, and chroma of 1 or 2. The 2BCg and 2Cg horizons are stratified sandy loam, loam, sandy clay loam, clay loam, silt loam, or silty clay loam. The 2Cg horizon contains thin strata of sand or loamy sand.

Timula Series

The Timula series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 10 to 35 percent.

Timula soils are similar to and are commonly adjacent to Mt. Carroll and Seaton soils. Mt. Carroll and Seaton soils do not have carbonates within a depth of 40 inches and contain more clay in the control section than the Timula soils. They are on the less convex slopes. Mt. Carroll soils have a thin dark surface layer.

Typical pedon of Timula silt loam, in an area of Seaton-Timula silt loams, 18 to 35 percent slopes, eroded; 1,080 feet east and 2,000 feet south of the northwest corner of sec. 29, T. 22 N., R. 5 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to weak medium granular; friable; few dark yellowish brown (10YR 4/4) fragments of subsoil material; neutral; abrupt smooth boundary.

Bw1—6 to 12 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; few faint dark brown (10YR 4/3) and common faint dark yellowish brown (10YR 4/4) films on faces of peds; neutral; clear smooth boundary.

Bw2—12 to 23 inches; yellowish brown (10YR 5/4) silt loam; weak coarse and medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) films on faces of peds; neutral; clear smooth boundary.

BC—23 to 28 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) relict mottles; weak coarse subangular blocky structure; friable; slight effervescence; mildly alkaline; gradual smooth boundary.

C—28 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; common fine prominent yellowish brown (10YR 5/6) and common fine distinct light gray (2.5Y 7/2) relict mottles; massive; friable; few fine accumulations of iron oxide; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 18 to 36 inches. The depth to carbonates ranges from 15 to 36 inches. Some pedons do not have carbonates in the lower part of the solum.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. The Bw horizon has value of 4 or 5 and chroma of 4 to 6. The BC and C horizons have hue of 2.5Y, value of 5 or 6, and chroma of 2 to 4. They are silt or silt loam and are mildly alkaline or moderately alkaline.

Titus Series

The Titus series consists of deep, poorly drained, slowly permeable soils on flood plains. These soils formed in clayey alluvium. Slopes range from 0 to 2 percent.

Titus soils are similar to Ambraw and Beaucoup soils and are commonly adjacent to Ambraw, Beaucoup, and Riley soils. Ambraw and Beaucoup soils are in landscape positions similar to those of the Titus soils. Ambraw soils contain less clay than the Titus soils and have more sand in the control section. Beaucoup soils contain less clay in the control section than the Titus soils. Riley soils are somewhat poorly drained and are in the slightly higher positions on the flood plains that are not subject to ponding. They formed in loamy over sandy materials.

Typical pedon of Titus silty clay loam, rarely flooded, 20 feet west and 10 feet north of the southeast corner of sec. 28, T. 20 N., R. 3 E.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

A1—8 to 17 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure; friable; many faint black (10YR 2/1) organic films on faces of peds; few concretions of iron oxide; neutral; clear smooth boundary.

A2—17 to 22 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; strong medium and fine angular blocky structure; firm; many faint black (10YR 2/1) organic films on faces of peds; few stains and concretions of iron oxide; neutral; clear smooth boundary.

Bg1—22 to 32 inches; dark gray (10YR 4/1) silty clay; few fine prominent strong brown (7.5YR 5/6) mottles; strong medium and fine prismatic structure; firm; common faint very dark gray (10YR 3/1) organic films on faces of peds; few stains and concretions of iron oxide; neutral; clear smooth boundary.

Bg2—32 to 46 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; few faint very dark gray (10YR 3/1) organic films on faces of peds; band of mottled dark gray (10YR 4/1) and strong brown (7.5YR 5/6) silty clay loam 1 inch thick at a depth of 39 inches; neutral; clear smooth boundary.

Bg3—46 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6 and 5/6) and yellowish brown (10YR 5/4) mottles; moderate coarse and medium subangular blocky structure; friable; few distinct pressure faces; neutral; clear smooth boundary.

BCg—52 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6), common fine prominent yellowish brown (10YR 5/4), and few fine distinct dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; friable; few concretions of iron oxide; few thin strata of clay loam; neutral.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon is neutral in hue and has value of 2 or 3 and chroma of 0 to 2. It is silty clay loam or silty clay. The Bg horizon has hue of 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or silty clay. The BCg horizon is silty clay loam or silty clay loam that has thin strata of loam or clay loam.

Udolpho Series

The Udolpho series consists of deep, poorly drained soils on outwash plains and stream terraces. These soils formed in loamy sediments over sandy outwash. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Udolpho soils are similar to Lawler soils and are commonly adjacent to Dickinson, Lawler, and Marshan soils. Dickinson soils are well drained and somewhat excessively drained and are higher on the landscape than the Udolpho soils. They contain more sand and less clay in the solum than the Udolpho soils and have a thicker dark surface soil. Lawler soils are somewhat poorly drained and are in landscape positions similar to those of the Udolpho soils. They have a thicker dark surface soil than the Udolpho soils. Marshan soils are very poorly drained and are in depressions that are subject to ponding. They have a thicker dark surface soil than the Udolpho soils.

Typical pedon of Udolpho loam, 2,320 feet east and 1,660 feet north of the southwest corner of sec. 25, T. 20 N., R. 6 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

Eg—8 to 13 inches; grayish brown (10YR 5/2) loam; few fine prominent olive brown (2.5Y 4/4) mottles; weak medium and thin platy structure; friable; few faint very dark grayish brown (10YR 3/2) organic films in root channels; slightly acid; clear smooth boundary.

Btg1—13 to 21 inches; dark grayish brown (2.5Y 4/2) clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; few medium concretions of manganese oxide; few fine stains of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg2—21 to 30 inches; grayish brown (2.5Y 5/2) sandy clay loam; common fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; about 5 percent gravel; few faint grayish brown (10YR 5/2) clay films on faces of peds; few medium concretions of iron and manganese oxide; few fine stains of iron oxide; slightly acid; abrupt smooth boundary.

2Cg1—30 to 45 inches; grayish brown (2.5Y 5/2) coarse sand; single grain; loose; about 5 percent gravel; neutral; clear smooth boundary.

2Cg2—45 to 60 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; about 5 percent gravel; neutral.

The thickness of the solum ranges from 24 to 40 inches. Some pedons contain as much as 10 percent gravel in the lower part of the solum. Reaction ranges from slightly acid to strongly acid in the Btg horizon.

The Eg horizon is loam or silt loam. The Eg and Btg horizons have hue of 2.5Y, value of 4 or 5, and chroma of 1 or 2. The Btg horizon is loam, clay loam, or sandy clay loam. The 2Cg horizon is coarse sand, sand, loamy coarse sand, loamy sand, gravelly sand, or gravelly coarse sand.

Virgil Series

The Virgil series consists of deep, somewhat poorly drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy stratified sediments. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Virgil soils are similar to Atterberry soils and are commonly adjacent to Richwood and Thorp soils. Atterberry soils formed entirely in loess. They are on uplands. Richwood soils are well drained and are in the more sloping or slightly higher positions. They have a thicker dark surface soil than the Virgil soils. Thorp soils are poorly drained and are in depressions that are subject to ponding. They have a thicker dark surface soil than the Virgil soils and are slowly permeable in the upper part of the profile.

Typical pedon of Virgil silt loam, 1,880 feet north and 140 feet west of the southeast corner of sec. 4, T. 21 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

E—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; few faint very dark gray (10YR 3/1) organic films in root channels; slightly acid; clear smooth boundary.

Bt—14 to 22 inches; brown (10YR 5/3) silty clay loam; grayish brown (10YR 5/2) faces of peds; common faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and fine subangular blocky structure; friable; common faint grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Btg1—22 to 29 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; grayish brown (10YR 5/2) faces of peds; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Btg2—29 to 44 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; common faint grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; vertical, grayish brown (2.5Y 5/2) silt loam filling root voids 1 inch in diameter; slightly acid; clear smooth boundary.

2Btg3—44 to 55 inches; grayish brown (2.5Y 5/2) silt loam that has few thin strata of loam; many fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few faint grayish brown (10YR 5/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.

2C—55 to 60 inches; brown (10YR 5/3) sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the solum ranges from 45 to 65 inches. The thickness of the loess ranges from 40 to 60 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. Pedons that have chroma of 3 or 4 in the matrix contain mottles with chroma of 1 or 2. The 2Bt horizon is loam, sandy loam, or silt loam. The 2C horizon is loam or sandy loam. It is stratified in some pedons.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Wakeland soils are similar to and are commonly adjacent to Lawson and Orion soils. Lawson and Orion soils are in landscape positions similar to those of the Wakeland soils. Lawson soils have a mollic epipedon. Orion soils have a dark buried soil within a depth of 40 inches.

Typical pedon of Wakeland silt loam, frequently flooded, 1,010 feet west and 2,040 feet south of the northeast corner of sec. 24, T. 22 N., R. 5 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; massive; friable; many thin strata of yellowish brown (10YR 5/4) silt loam; neutral; clear smooth boundary.

C1—9 to 17 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; many thin strata of yellowish brown (10YR 5/4) and dark grayish brown (10YR 4/2) silt loam; few fine stains of iron and manganese oxide; neutral; clear wavy boundary.

C2—17 to 25 inches; dark grayish brown (10YR 4/2) silt loam; few fine prominent yellowish brown (10YR 5/8) and few fine faint grayish brown (10YR 5/2) mottles; massive; very friable; many thin strata of yellowish brown (10YR 5/4), very dark gray (10YR 3/1), and pale brown (10YR 6/3) silt loam; common fine stains of iron and manganese oxide; neutral; clear wavy boundary.

C3—25 to 40 inches; yellowish brown (10YR 5/4) silt loam; few fine prominent strong brown (7.5YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; massive; very friable; many thin strata of very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) silt loam; few very dark grayish brown (10YR 3/2) wormcasts; few distinct dark grayish brown (10YR 4/2) organic films along root channels; few fine stains of iron and manganese oxide; neutral; clear wavy boundary.

C4—40 to 60 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; massive; very friable; many thin strata of dark grayish brown (10YR 4/2), yellowish brown (10YR 5/4), and very dark gray (10YR 3/1) silt loam; few fine stains of iron and manganese oxide; neutral.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The upper part of the C horizon has hue of 7.5YR, value of 4 to 6, and chroma of 1 to 4. It is mottled. The lower part of the C horizon has hue of 2.5Y, value of 5 or 6, and chroma of 1 to 6. Some pedons have a dark buried soil below a depth of 40 inches.

Watseka Series

The Watseka series consists of deep, somewhat poorly drained, rapidly permeable soils on outwash plains and stream terraces. These soils formed in sandy sediments. Slopes range from 0 to 2 percent.

Watseka soils are similar to Hoopeston soils and are commonly adjacent to Gilford and Sparta soils. Gilford soils are very poorly drained and are in the lower positions that are subject to ponding. They contain more clay in the control section than the Watseka soils. Hoopeston soils also contain more clay in the control section than the Watseka soils. They are in landscape positions similar to those of the Watseka soils. Sparta soils are excessively drained and are slightly higher on the landscape than the Watseka soils.

Typical pedon of Watseka loamy sand, 2,520 feet west and 2,280 feet north of the southeast corner of sec. 33, T. 19 N., R. 4 E.

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; neutral; abrupt smooth boundary.

AB—10 to 18 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; very friable; common faint very dark brown (10YR 2/2) organic films on faces of peds; slightly acid; clear smooth boundary.

Bw—18 to 24 inches; dark grayish brown (10YR 4/2) loamy sand; weak medium and fine subangular blocky structure; very friable; neutral; gradual smooth boundary.

C1—24 to 47 inches; grayish brown (10YR 5/2) sand; few medium faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; single grain; loose; neutral; gradual smooth boundary.

C2—47 to 60 inches; light brownish gray (10YR 6/2) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; few fine pebbles; neutral.

The thickness of the solum ranges from 24 to 36 inches. The mollic epipedon is 10 to 20 inches thick.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bw horizon has hue of 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is loamy fine sand, loamy sand, fine sand, or sand.

Waukee Series

The Waukee series consists of deep, well drained soils on stream terraces and outwash plains. These soils formed in loamy sediments over sandy and gravelly outwash. Permeability is moderate in the loamy sediments and very rapid in the underlying sandy and gravelly material. Slopes range from 0 to 2 percent.

Waukee soils are similar to Waukegan soils and are commonly adjacent to Dickinson and Lawler soils. Dickinson and Waukegan soils are in landscape positions similar to those of the Waukee soils. Dickinson soils have more sand in the solum than the Waukee soils and do not contain gravel. Waukegan soils contain less sand in the solum than the Waukee soils. Lawler soils are somewhat poorly drained and are slightly lower on the landscape than the Waukee soils.

Typical pedon of Waukee loam, 180 feet north and 360 feet west of the southeast corner of sec. 36, T. 21 N., R. 7 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; clear smooth boundary.

A—8 to 14 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure parting to moderate fine granular; friable; slightly acid; clear smooth boundary.

BA—14 to 19 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; many faint dark brown (10YR 3/3) organic films on faces of peds; slightly acid; clear smooth boundary.

Bw1—19 to 27 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few faint brown (10YR 4/3) coatings on faces of peds; slightly acid; abrupt smooth boundary.

Bw2—27 to 34 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable; few faint brown (10YR 4/3) coatings on faces of peds; about 5 to 10 percent gravel; medium acid; abrupt smooth boundary.

2BC—34 to 43 inches; brown (7.5YR 4/4) and strong brown (10YR 5/6) loamy coarse sand; weak medium subangular blocky structure; very friable; about 8 to 12 percent gravel; medium acid; clear smooth boundary.

2C1—43 to 56 inches; brown (7.5YR 4/4) and strong brown (10YR 5/6) coarse sand; single grain; loose; about 5 to 10 percent gravel; medium acid; abrupt smooth boundary.

2C2—56 to 60 inches; yellowish brown (10YR 5/8) sand; single grain; loose; few pebbles; slightly acid.

The thickness of the solum ranges from 32 to 48 inches. Depth to the sandy or gravelly material ranges from 25 to 40 inches. The mollic epipedon ranges from 12 to 18 inches in thickness.

The A horizon is loam or silt loam. In some pedons a thin zone of sandy loam or coarse sandy loam less than 5 inches thick is in the lower part of the Bw horizon. In some pedons the 2C horizon contains strata with 20 to 50 percent gravel.

Waukegan Series

The Waukegan series consists of deep, well drained, moderately permeable over rapidly permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying sandy outwash. Slopes range from 0 to 10 percent.

Waukegan soils are similar to Dickinson and Tell soils and are commonly adjacent to Dickinson, Joy, Oakville, and Tell soils. Joy soils are somewhat poorly drained and are in the slightly lower positions. They contain sandy outwash below a depth of 40 inches. Dickinson, Oakville, and Tell soils are in landscape positions similar to those of the Waukegan soils. Dickinson and Oakville soils contain more sand in the solum than the Waukegan soils. Oakville and Tell soils have an ochric epipedon.

Typical pedon of Waukegan silt loam, 0 to 2 percent slopes, 480 feet south and 170 feet west of the northeast corner of sec. 26, T. 19 N., R. 5 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine granular structure; very friable; neutral; abrupt smooth boundary.

A—8 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; neutral; clear smooth boundary.

BA—13 to 19 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bw—19 to 31 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; friable; common faint brown (10YR 4/3) films on faces of peds; slightly acid; abrupt smooth boundary.

2BC—31 to 35 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few distinct brown (10YR 4/3) films on faces of peds; slightly acid; abrupt smooth boundary.

2C1—35 to 43 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; about 5 percent gravel; slightly acid; clear smooth boundary.

2C2—43 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the loess ranges from 25 to 40 inches. The mollic epipedon ranges from 10 to 20 inches in thickness.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or loam. The B horizon has value of 3 to 5 and chroma of 3 to 6. It ranges from strongly acid to neutral. The 2BC horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loamy sand or sandy loam. The 2C horizon has hue of 7.5YR, value of 4 to 6, and chroma of 3 to 6. It ranges from medium acid to mildly alkaline.

Waukegan silt loam, 5 to 10 percent slopes, eroded, has a thinner dark surface soil than is defined as the range for the series. Also, it does not have a contrasting particle-size class within the control section. These differences, however, do not affect the use or behavior of the soil.

Whalan Series

The Whalan series consists of moderately deep, well drained soils on high limestone benches. These soils formed in loamy material and in residuum derived from limestone bedrock. Permeability is moderate in the upper part of the solum and slow in the lower part. Slopes range from 1 to 5 percent.

Whalan soils are similar to Woodbine soils and are commonly adjacent to Lamont and Plainfield soils. Lamont and Plainfield soils contain more sand throughout than the Whalan soils and do not have a lithic contact within a depth of 60 inches. They are upslope from the Whalan soils. Woodbine soils have a lithic contact below a depth of 40 inches. They are in the more sloping areas on uplands.

Typical pedon of Whalan loam, 1 to 5 percent slopes, 840 feet west and 60 feet north of the southeast corner of sec. 6, T. 21 N., R. 4 E.

Ap—0 to 5 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; slightly acid; abrupt smooth boundary.

E—5 to 11 inches; brown (10YR 5/3) loam; weak thick platy structure parting to weak fine angular blocky; very friable; few faint dark brown (10YR 3/3) organic films on faces of peds; slightly acid; clear smooth boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; few faint dark brown (10YR 3/3) organic films on faces of peds; few fine stains of iron oxide; medium acid; clear smooth boundary.

Bt2—18 to 24 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds; few distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; many medium stains of iron oxide; slightly acid; clear smooth boundary.

2Bt3—24 to 29 inches; brown (10YR 5/3) and yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; common distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; many medium stains of iron oxide; neutral; abrupt irregular boundary.

2R—29 inches; hard, fractured limestone bedrock; yellow (10YR 7/6), soft, calcareous, weathered limestone in the upper 1 inch.

The thickness of the solum and the depth to bedrock ranges from 20 to 40 inches.

The 2Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 3 to 6. It is clay, silty clay, or clay loam.

Woodbine Series

The Woodbine series consists of deep, well drained soils on uplands. These soils formed in loess, in glacial drift, and in material weathered from limestone bedrock. Permeability is moderate in the upper part of the solum and slow in the lower part. Slopes range from 7 to 15 percent.

Woodbine soils are similar to Whalan soils and are commonly adjacent to Lamont, Pecatonica, and Tell soils. Lamont, Pecatonica, and Tell soils do not have a layer of residuum over a lithic contact. Pecatonica soils are upslope from the Woodbine soils. Lamont and Tell soils are downslope from the Woodbine soils. Lamont soils contain more sand throughout than the Woodbine soils. Tell soils formed in loess over sandy outwash. Whalan soils have a lithic contact within a depth of 40 inches. They are on high limestone benches in the less sloping areas.

Typical pedon of Woodbine silt loam, 7 to 15 percent slopes, eroded, 2,580 feet west and 1,900 feet south of the northeast corner of sec. 2, T. 22 N., R. 4 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few dark yellowish brown (10YR 4/4) fragments of subsoil material; common faint dark brown (10YR 3/3) organic films on faces of peds; medium acid; abrupt smooth boundary.

Bt1—7 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—16 to 24 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—24 to 30 inches; brown (7.5YR 4/4) and yellowish brown (10YR 5/4) clay loam; moderate medium and fine subangular blocky structure; friable; common faint dark brown (7.5YR 3/4) clay films on faces of peds; about 10 percent chert and igneous pebbles;

medium acid; clear smooth boundary.

2Bt4—30 to 41 inches; brown (7.5YR 4/4) clay loam; moderate medium angular blocky structure; friable; common distinct reddish brown (5YR 4/4) clay films on faces of peds; few chert pebbles and igneous pebbles; slightly acid; abrupt wavy boundary.

3Bt5—41 to 46 inches; yellowish red (5YR 4/6) silty clay; moderate medium subangular blocky structure; firm; few distinct reddish brown (5Y 4/4) clay films on faces of peds; few chert pebbles; slightly acid; abrupt irregular boundary.

3R—46 inches; hard, fractured limestone bedrock; yellow (10YR 7/8), soft, calcareous, weathered limestone in the upper 2 inches.

The thickness of the solum and the depth to limestone bedrock range from 40 to 60 inches. The combined thickness of the loess and the glacial drift ranges from 36 to 50 inches. Thickness of the residuum ranges from 2 to 10 inches.

The 2Bt horizon is typically clay loam but is loam, sandy clay loam, or sandy loam in the lower part in some pedons. The 3Bt horizon is silty clay, clay, cherty silty clay, or cherty clay.

Zumbro Series

The Zumbro series consists of deep, well drained soils on flood plains. These soils formed in sandy and loamy alluvium. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 1 to 4 percent.

Zumbro soils are commonly adjacent to Ambraw, Riley, and Ross soils. Ambraw soils are poorly drained and are lower on the landscape than the Zumbro soils. They formed in loamy alluvium. Riley soils are somewhat poorly drained and are slightly lower on the landscape than the Zumbro soils. They formed in loamy alluvium over sandy alluvium. Ross soils formed in loamy alluvium. They are in landscape positions similar to those of the Zumbro soils.

Typical pedon of Zumbro sandy loam, rarely flooded, 1 to 4 percent slopes, 2,200 feet north and 2,380 feet east of the southwest corner of sec. 34, T. 22 N., R. 3 E.

Ap—0 to 6 inches; very dark brown (10YR 2/2) sandy loam, dark brown (10YR 3/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A—6 to 16 inches; very dark brown (10YR 2/2) sandy loam, dark brown (10YR 3/3) dry; weak medium subangular blocky structure parting to weak medium granular; friable; neutral; clear smooth boundary.

AB—16 to 25 inches; dark brown (10YR 3/3) loamy sand, dark yellowish brown (10YR 4/4) dry; weak medium subangular blocky structure; very friable; common faint very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bw—25 to 34 inches; brown (10YR 4/3) loamy sand; weak medium subangular blocky structure; very friable; common faint dark brown (10YR 3/3) organic films on faces of peds; neutral; clear smooth boundary.

C1—34 to 53 inches; yellowish brown (10YR 5/6) sand; single grain; loose; neutral; clear smooth boundary.

C2—53 to 60 inches; yellowish brown (10YR 5/6) sand; common coarse distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 30 to 45 inches. Some pedons contain free carbonates within a depth of 60 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is fine sandy loam, sandy loam, or loamy fine sand. It ranges from medium acid to mildly alkaline. The Bw horizon has value and chroma of 3 or 4. It ranges from medium acid to mildly alkaline. The C horizon has value of 5 or 6 and chroma of 3 to 6. It ranges from slightly acid to mildly alkaline.

Formation of the Soils

Soils are a product of the environment in which they formed. They are the result of interactions between five soil-forming factors *(7)*. The characteristics of a soil at any given time are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the type of plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the soil-forming factors have acted on the soil material. Climate and plant and animal life are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks that may have been relocated by water, glaciers, or wind, slowly changing it to a natural body that has genetically related horizons. The effects of climate, vegetation, and animal life are conditioned by relief. The parent material also affects the kind of soil profile that forms and, in a few cases, determines it almost entirely. Time is needed to change the parent material into a soil profile.

The five factors of soil formation are so closely interrelated that few generalizations can be made regarding the effects of one factor unless conditions are specified for the others.

Parent Material

Dr. Richard C. Anderson, chairman, Department of Geology, Augustana College, Rock Island, Illinois, helped prepare this section.

Parent material is the unconsolidated geologic material in which a soil forms. It determines the mineralogical and chemical composition of the soil. To a large extent, parent material also determines the rate at which soil formation takes place. The soils in Whiteside County formed dominantly in loess, glacial outwash, glacial till, eolian sand, alluvium, organic deposits, lacustrine deposits, residuum, and colluvium.

The glacial history of Whiteside County has contributed to a complex distribution of parent materials (fig. 17). In pre-Illinoian time the Mississippi River flowed through the county in a more southeasterly direction than it does today *(3)*. Glacial advances from the east during Illinoian and Wisconsin times blocked the river's flow and formed glacial lakes near the ice margins. Lacustrine sediments accumulated in these glacial lakes. The flow of the Mississippi River was diverted to the south and west. Upon retreat of the Wisconsin glacier, the outwash deposits in the preglacial river valley were thick enough to prevent the Mississippi River from returning to its former course. Instead it assumed its present channel. Base soil in the glacial valley was a source of silt, which was deposited as a blanket of loess in the uplands. Winds reworked the outwash sands into dunes. Bogs of organic deposits formed in areas that had no natural outlets.

Peoria loess in Whiteside County ranges in thickness from about 25 to 30 feet along the Mississippi River bluffs to about 10 feet on the stable upland divides in the northeastern part of the county. Soils that formed in loess commonly are silt loam or silty clay loam. Mt. Carroll and Downs soils are examples.

Glacial outwash is material that was swept out and sorted by streams of meltwater and deposited beyond a glacial ice front. Outwash is loamy or sandy and commonly is stratified. Marshan soils, for example, formed in loamy deposits over sandy outwash. In many areas of the county, the outwash materials are covered by a thin loess cap. In these areas the soils formed in two kinds of parent material. Waukegan soils, for example, formed in loess over sandy outwash.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of a mixture of clay, silt, sand, and gravel. In Whiteside County the only till that is believed to have contributed to the formation of the present soils is of Illinoian age (more than 125,000 years ago). In many areas the paleosol that formed in till has been removed by erosion. The present material appears less weathered and probably formed in till of a more recent age *(9)*. Soils that formed in glacial till commonly are loam or clay loam. Hickory soils are examples.

Eolian sands are in areas with dunelike topography. The sand is primarily quartz and is very resistant to weathering. Soils that formed in eolian sand commonly have a texture of loamy sand or sand. Sparta soils are examples.

Figure 17.—This large granite boulder on the flood plain along Spring Creek provides evidence of past glacial ice flow into the area.

Alluvium is sediment that was deposited by streams and rivers. It is on the bottom land along the Mississippi and Rock Rivers and their tributaries. The soil textures are determined by the velocity of the water at the time of deposition. Soils that were deposited near the main water channel, where floodwater velocity is greatest, tend to be loamy sand or sandy loam. Zumbro soils are examples. Soils having a texture of silt loam or silty clay loam, such as Titus soils, were deposited farther from the main water channel, where floodwater velocity is slower.

In the narrower areas of bottom land along the tributaries, the alluvium resulted primarily from erosion of the loess-covered hillsides. Alluvial soils in these areas are silt loam. Wakeland soils are examples.

Areas of local alluvium are along the base of the bluffs. These areas consist of silty alluvial fans and slope wash. Littleton and Raddle soils are examples of soils that formed in local alluvium.

Organic deposits consist of plant material that has accumulated in marshes and in abandoned stream channels. These areas were very wet during the time of soil formation, and plant materials accumulated more rapidly than the rate of decomposition. In this survey area, the materials are so decomposed that plant parts cannot be recognized, and thus the materials are called muck. Houghton soils are examples.

Lacustrine deposits consist of materials that settled from the standing water in glacial lakes. The soils that formed in these deposits commonly have a texture of silty clay. They commonly have a thin layer of loess at the surface. Niota soils are examples.

Residuum is material that has weathered from the limestone bedrock. In Whiteside County residuum occurs in combination with overlying sediments of loess and glacial drift. The limestone is mostly of Silurian age, but small areas of Ordovician-age limestone are in the extreme northwest and northeast corners of the county *(8)*. Residuum is commonly silty clay or clay. Woodbine soils formed partially in residuum.

Colluvium is a combination of soil material and rock fragments that accumulated at the base of slopes as a result of gravity. In Whiteside County the rock fragments consist of channers, flagstones, and cobblestone of limestone. The material is commonly cobbly loam or very cobbly loam. Lacrescent soils formed in colluvium.

Climate

Whiteside County has a temperate, humid, continental climate. Climate is a very important factor in soil formation because of its effects on weathering, vegetation, and erosion. Temperature and precipitation affect the physical and chemical nature of the soil. The weathering of minerals in the soils increases as temperature increases. Precipitation provides the water necessary to promote most physical and chemical weathering processes. Climate also affects soil formation through its interaction with vegetation. The temperature and precipitation in the county are favorable for both prairie grasses and deciduous trees.

Precipitation can also influence soil formation through its effect on erosion. As the rate of erosion approaches the rate of soil formation, the soil generally exhibits less profile development.

Plant and Animal Life

Plants have been the principal organisms influencing the formation of the soils in Whiteside County. Bacteria, fungi, earthworms, insects, burrowing animals, and human activities also have been important.

The chief contribution of plant and animal life to soil formation is the addition of organic material. The amount and kind of organic matter on and in the soil depend on the kind of native plants that grew on the soil. The native vegetation in the survey area was dominantly prairie grasses and deciduous trees. As the grasses died and decomposed, many fine, fibrous roots added large amounts of organic matter to the soil profile. The soils that formed under grasses have a thick, black or dark brown surface layer. Examples are Port Byron soils. In contrast, soils that formed under deciduous trees have a thinner, lighter colored surface layer because the source of the organic matter is mainly leaf litter on the surface. Seaton soils are examples.

Bacteria, fungi, and other micro-organisms help to break down organic matter and thus provide nutrients that can be used by plants and other soil organisms. The stability of soil aggregates is affected by microbial activity because cellular excretions from these organisms help to bind soil particles together. Stable aggregates help to maintain soil porosity and promote favorable relationships among soil, water, and air. Earthworms, crayfish, insects, and large burrowing animals tend to incorporate organic matter into the soil and to keep the soil open and porous.

Relief

Relief has markedly affected the soils in Whiteside County through its influence on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes in the county range from nearly level to very steep. Natural drainage ranges from excessively drained on sandy ridgetops to very poorly drained in depressions. Through its effect on aeration of the soil, drainage determines the color of the soil. Aspect, or the direction of slope, has a microclimatic influence on soils. South- and west-facing slopes receive more direct sunlight during the day and thus are warmer and drier than north- and east-facing slopes. Runoff is most rapid on the steeper slopes. It is temporarily ponded in low areas. Water and air move freely through well drained soils but slowly through poorly drained soils. In Raddle soils and other well drained, well aerated soils, the iron and aluminum compounds that give most soils their color are oxidized and brightly colored. Titus soils and other poorly drained, poorly aerated soils are dull gray and mottled.

Time

The length of time that the soil material remains in place and is acted on by the other soil-forming processes has an effect on the kind of soil that forms. Soils on stable uplands commonly have well defined genetic horizons. Fayette soils are examples. Soils that formed in alluvium, however, such as Wakeland soils, show less profile development.

The weathering resistance of the parent material can modify the effect of time on soil formation. Eolian sand, consisting mostly of quartz, is very resistant to weathering. Soils that formed in eolian sand commonly have weakly developed horizons. Plainfield soils are examples.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

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:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

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.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

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.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

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.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth 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 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

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 establishing terraces, diversions, and other water-control structures 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.

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.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

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.

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.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

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 frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow.

Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

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 human or animal activities 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 is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

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.

Forb. Any herbaceous plant not a grass or a sedge.

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 meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

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.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 7.6 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 (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the 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.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

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. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

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, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon 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) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

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 overlying 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, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock 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 capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

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:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

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.

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 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 (7.6 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 the 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. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

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, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

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.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

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.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

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 0.2 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, such as 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. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

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 degrees of acidity or alkalinity, expressed as pH values, are:

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.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

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.

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.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the substratum. 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 surface runoff.

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.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns, and in swelling clayey soils, where there is marked change in moisture content.

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 ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 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 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

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, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind erosion and water erosion.

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 wind erosion 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 solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

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.

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 that is too thin for the specified use.

Till plain. An area of nearly level to undulating soils 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, 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 meltwater. 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 a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.