United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Illinois Agricultural
Experiment Station

Soil Survey of Bureau County, Illinois

How To Use This Soil Survey

General Soil Map

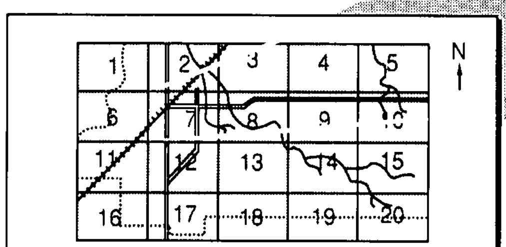
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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.

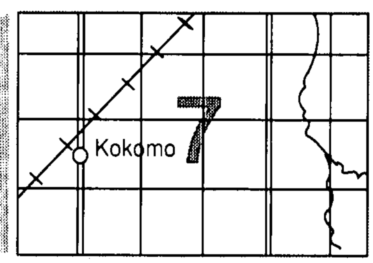
Detailed Soil Maps

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.

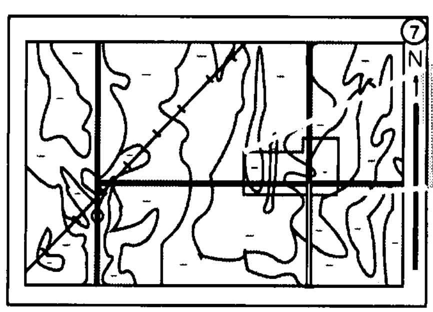


INDEX TO MAP SHEETS



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.



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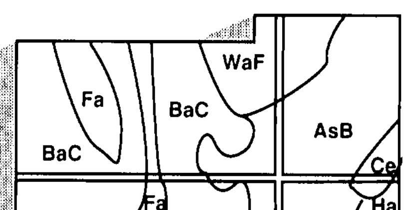

AREA OF INTEREST

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 1986. Soil names and descriptions were approved in April 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. 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 Bureau County Soil and Water Conservation District. Part of the cost was shared by the Bureau County Board 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.

This soil survey is Illinois Agricultural Experiment Station Soil Report No. 139.

Cover: An area of Birkbeck silt loam, 5 to 10 percent slopes, eroded. Parallel tile-outlet terraces protect this area from further erosion. They also protect the farm pond from siltation and loss of reservoir capacity.

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Issued June 1992

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Summary of Tables

Foreword

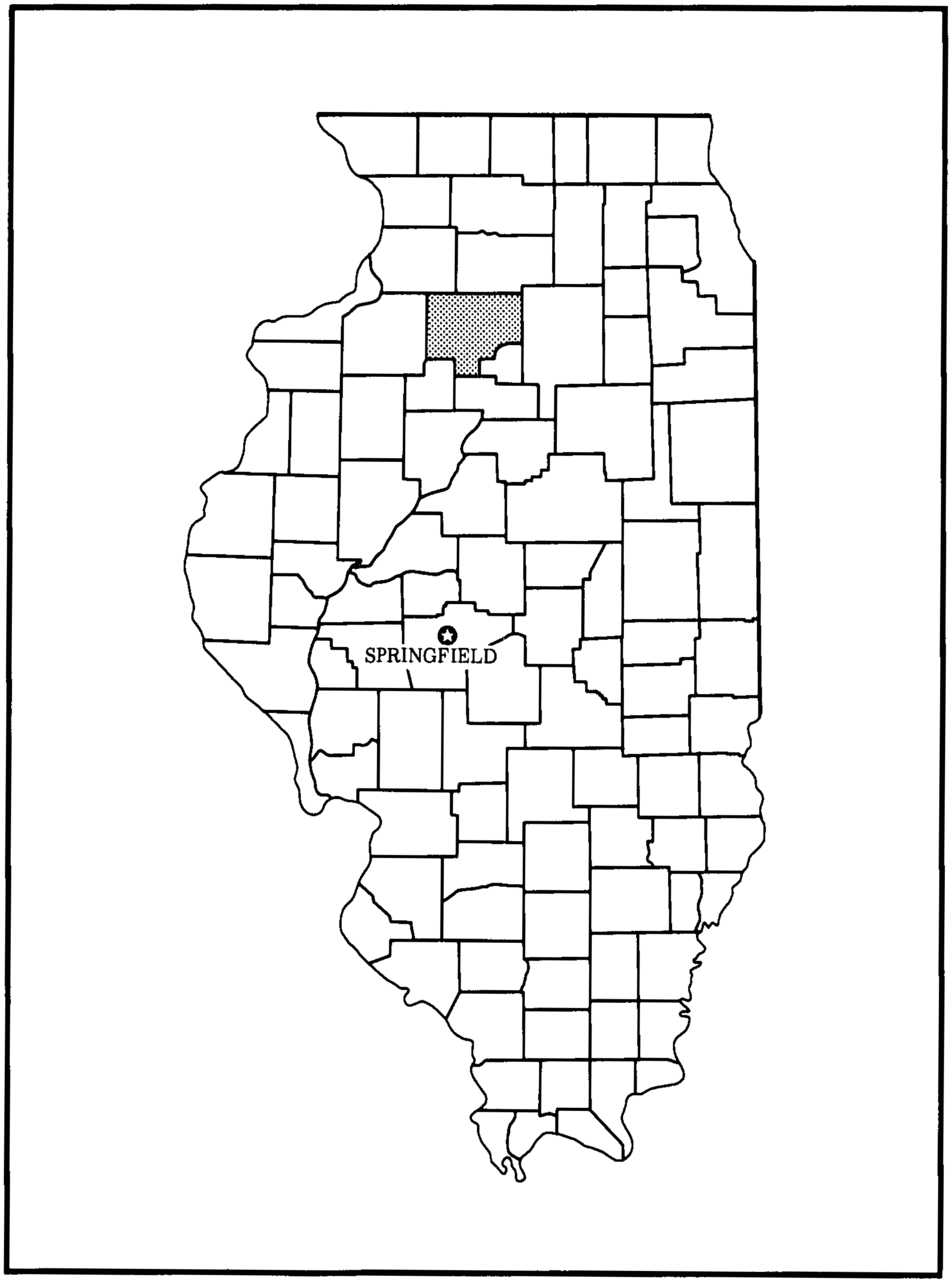
This soil survey contains information that can be used in land-planning programs in Bureau County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

Charles Whitmore
State Conservationist
Soil Conservation Service



Location of Bureau County in Illinois.

Soil Survey of
Bureau County, Illinois

By S.E. Zwicker, Soil Conservation Service

Soils surveyed by S.E. Zwicker, D.B. Rahe, B.R. Putman, M.J. Walczynski, and S.J. Indorante, Soil Conservation Service, and G.J. Pomeranke, W.A. Ebert, K.G. Kroeger, T.J. Fredrickson, and L.L. Acker, Bureau County

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

Bureau County is in north-central Illinois. It has an area of 559,110 acres, or about 874 square miles. It is bounded by Whiteside and Lee Counties to the north, LaSalle County to the east, Henry County to the west, Stark and Marshall Counties to the south, and the Illinois River in part of the southeast corner. In 1980, the population of the county was about 39,114. Princeton, the county seat, had a population of 7,342 *(13)*.

This soil survey updates the survey of Bureau County published by the University of Illinois in 1921 *(8)*. It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

The northwestern part of Bureau County is a nearly level outwash plain with prominent sand dunes. It is drained by the Green River. The eastern part is a till plain with low, broad ridges. The central and southeastern parts are a rolling till plain that is drained by Bureau Creek and the Illinois River. The southwestern part of the county is an older (Illinoian) dissected till plain.

Farming is the main economic enterprise in the county. The climate favors cash grain, vegetable, and livestock farming. The major crops are corn and soybeans. The major livestock enterprises produce beef and pork. Industrial activities include seed corn production, light manufacturing, grain storage and handling, food processing, and road construction.

Soil scientists have determined that there are about 78 different kinds of soil in Bureau County. These soils range widely in texture, natural drainage, and other characteristics. The soils in the eastern half of the county and in the southwestern part are dominantly well drained or moderately well drained, gently sloping and sloping, and silty. Erosion is a severe hazard in many places. Conservation measures help to control erosion and minimize sedimentation. If properly managed, the soils are well suited to field crops, hay, pasture, and trees. In most areas they are suited to building site development.

The soils in the northwestern part of the county generally are poorly drained or somewhat poorly drained, nearly level, and loamy. Wetness is a major limitation affecting the use of these soils. Because of extensive tile drains and ditches, the soils are well suited to field crops. Because of the wetness, they generally are poorly suited to most other uses.

The following sections provide general information about Bureau County. They describe history, farming, transportation facilities, natural resources, vegetation, and climate.

History

Prior to settlement, the area now known as Bureau County had abundant wildlife, native prairies, marshes, and forests. The land was claimed by the Pottawatamie Indian Tribe. The main village of this tribe was located at a site where the town of Tiskilwa now stands.

Henry Thomas is credited as the first settler in Bureau County. In 1828, he built a cabin in an area along West Bureau Creek about 4 miles north of the present town of Wyanet. By 1867, the population of the county was about 34,000.

Bureau County was originally included with Putnam County. In 1837, however, the legislature passed an act separating Bureau County from Putnam County. This act established the present-day boundaries of Bureau County, except for Milo and Wheatland Townships, which were added 2 years later *(7)*.

Coal mining in eastern Bureau County was a major reason for an influx of immigrants in the 1880's. Spoil piles from underground mining remain at Cherry, Dalzell, Ladd, and Seatonville. The last active strip mine was closed in 1964. The area that was mined is west of Sheffield *(6)*.

The Illinois-Mississippi Canal serviced barge traffic from the Illinois River to the Mississippi River between 1907 and 1951. Soon after completion, however, it was considered too shallow for many of the larger barges. Today, it serves as a recreational facility. It has been renamed the Hennepin Canal Parkway.

Much of the acreage of wetland wildlife habitat and woodland was destroyed between 1867 and 1900. The major swamps were drained by tiling and ditching so that they could be used for agricultural production.

In 1942, the citizens of the county formed the Bureau County Soil Conservation District. The formation of this district allowed farmers to receive technical assistance in conservation planning from the Soil Conservation Service.

Farming

Farming is the most important enterprise in the county. In 1982, a total of 511,779 acres was used for farming. There were 1,629 farms in the county. The average farm size was 314 acres *(13)*.

In 1982, a total of 296,469 acres in the county was used for corn, 114,100 acres for soybeans, 4,688 acres for oats, 4,219 acres for wheat, 8,580 acres for hay, and 12,273 acres for pasture. Vegetable crops, dominantly green peas, were harvested on about 789 acres *(13)*. Sweet corn and melons also were grown.

The livestock raised in the county includes beef cattle, hogs, dairy cattle, chickens, sheep, and horses. The value of livestock products sold in the county is less than 40 percent of the total value of the agricultural products.

Transportation Facilities

Transportation facilities are generally good throughout the county. Several U.S. and state highways cross the county. Interstate 80 extends from east to west through the central part of the county. Interstate 180 crosses the southeastern part. Several railroads provide freight and passenger service. Barge service is available on the Illinois River, in the southeast corner of the county.

Natural Resources

An abundant supply of sand and gravel is available in scattered areas throughout the county. The most extensive deposits are along the front slopes of the Bloomington terminal moraine near Wyanet and Walnut. The sand and gravel are used primarily as road material and concrete aggregate.

Most of the ground water in Bureau County is obtained from sand and gravel aquifers beneath approximately 200 feet of glacial drift *(5)*.

Vegetation

Most of the native vegetation in the county has been destroyed. The native vegetation was dominantly prairie grasses interspersed with forested areas along Bureau Creek, the Green River, the Illinois River, and tributaries of these streams. Smaller groves of trees were in scattered areas throughout the county. Rushes, cattails, and prairie cordgrass grew in swampy areas. The prairie areas of the sandhills region supported grasses, such as little bluestem, sand bluestem, sideoats grama, dropseed, and sandreed grass, and forbs, such as goatsrue. The most common grasses in other areas of the county were big bluestem, indiangrass, eastern gamagrass, and bluejoint reedgrass (fig. 1). These areas also supported forbs, such as prairie dock and compassplant. The native trees throughout the county were oak, hickory, and maple and scattered black walnut and elm.

Climate

Prepared by the Illinois State Water Survey, Champaign, Illinois.

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

Figure 1.—Restored prairie in an area of Muscatine silt loam. Big bluestem once covered a large part of Bureau County.

In winter, the average temperature is 27 degrees F and the average daily minimum temperature is 18.4 degrees. The lowest temperature on record, which occurred at Ottawa on January 28, 1963, is -21 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 85.1 degrees. The highest recorded temperature, which occurred at Ottawa on July 1, 1956, is 102 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 34.79 inches. Of this, 22.73 inches, or about 65 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 18 inches. The heaviest 1-day rainfall during the period of record was 8.77 inches at Ottawa on July 14, 1958.

The average seasonal snowfall is 28 inches. The greatest snow depth at any one time during the period of record was 28 inches. On the average, 44 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.

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, the landforms, relief, climate, and the 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 several 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 the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern. The textures in the association name are the surface textures only.

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

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

The general soil map of Bureau County joins the general soil maps of Henry, Whiteside, Lee, La Salle, and Putnam Counties. Some of the names of associations in these counties do not agree exactly with those in Bureau County because of variations in the extent of the major soils in the associations or because of conceptual changes in the soil classification system. These differences do not significantly affect the use of the maps for general planning.

Nearly Level Soils That Are Subject to Flooding

These soils are on flooded outwash plains and flood plains. Protection from flooding and maintenance of subsurface drainage systems are the major management concerns.

1. Selma Association

Loamy, poorly drained soils that formed in glacial outwash; on outwash plains

This association consists of nearly level, occasionally flooded soils on outwash plains adjacent to the major streams and drainageways. Shallow depressions, slightly elevated areas, and sand dunes are throughout the association. Slope ranges from 0 to 2 percent.

This association makes up about 3 percent of the county. It is about 77 percent Selma and similar soils and 23 percent minor soils (fig. 2).

Typically, the surface layer of the Selma soils is black, friable loam about 10 inches thick. The subsurface layer also is black, friable loam. It is about 5 inches thick. The subsoil is about 32 inches thick. It is mottled and friable. The upper part is grayish brown loam. The next part is light brownish gray silt loam. The lower part is light brownish gray fine sandy loam. The substratum to a depth of 60 inches or more is calcareous. The upper part is grayish brown, very friable sandy loam. The lower part is pale brown, loose sand that has thin strata of silt loam.

Minor in this association are the Aurelius, Canisteo, Edwards, Harpster, Oakville, Pella, and Tell soils. The very poorly drained Aurelius and Edwards soils formed in organic material and marl. They are in depressions below the Selma soils. The poorly drained Canisteo and Harpster soils are calcareous. They are in landscape positions similar to those of the Selma soils. The well drained Oakville and Tell soils are droughty. They are on scattered dunes throughout the association. The poorly drained Pella soils have more clay in the surface soil and subsoil than the Selma soils. They are calcareous within a depth of 40 inches. They are in depressions below the Selma soils.

Most areas of this association are cultivated. The Selma soils are well suited to cultivated crops. The seasonal high water table and the flooding are the major limitations affecting cultivated crops. Properly maintained drainage systems and levees are needed.

This association generally is unsuited to septic tank absorption fields and dwellings and poorly suited to local roads and streets because of the flooding, the seasonal high water table, the potential for frost action, and low strength.

2. Minneiska-Landes Association

Loamy and silty, moderately well drained and well drained soils that formed in alluvium; on flood plains

This association consists of nearly level, rarely flooded to frequently flooded soils on flood plains along

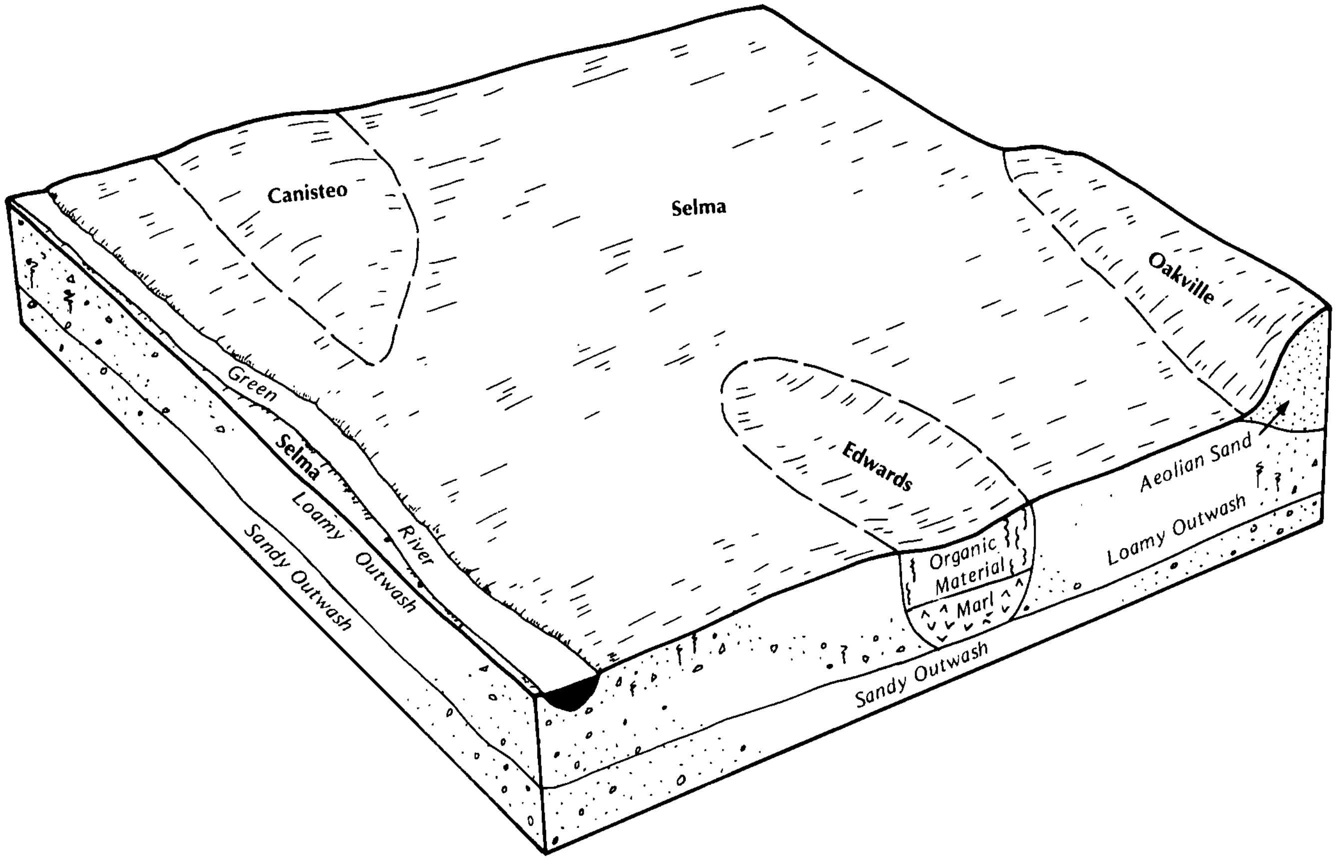


Figure 2.—Typical pattern of soils and parent material in the Selma association.

the major streams. Higher stream terraces that are not flooded are in scattered areas throughout the association. Slope ranges from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 45 percent Minneiska soils, 35 percent Landes and similar soils, and 20 percent minor soils (fig. 3).

The Minneiska soils are frequently flooded or occasionally flooded. Typically, the surface layer is very dark grayish brown, friable, calcareous loam about 8 inches thick. The substratum extends to a depth of more than 60 inches. It is friable to loose and is calcareous. The upper part is very dark grayish brown silt loam that has thin strata of dark brown and very dark gray silt loam. The next part is very dark grayish brown loam that has thin strata of dark brown sand. The lower part is dark brown, stratified sand, loam, and silt loam.

The Landes soils are occasionally flooded or rarely flooded. Typically, the surface layer is very dark grayish brown, friable, calcareous silt loam about 11 inches thick. The subsoil is about 24 inches thick. It is friable and very friable, dark brown, and calcareous. The upper part is loam. The next part is fine sandy loam. The lower part is loamy fine sand. The substratum to a depth of 60 inches or more is dark brown and calcareous. The upper part is very friable loamy fine sand. The lower part is loose fine sand.

Minor in this association are the Jasper, Lawson, Martinsville, Rodman, and Warsaw soils. The well drained Jasper, Martinsville, and Warsaw soils and the excessively drained Rodman soils are not subject to flooding. They are on stream terraces and terrace benches above the major soils. The somewhat poorly drained Lawson soils are in landscape positions similar to those of the major soils.

Most areas of this association are cultivated. The major soils are well suited to cultivated crops. Flooding is a hazard on both soils, and the available water capacity is a limitation in the Landes soils. A high content of lime in the Minneiska soils is an additional limitation. Planting crops after the flooding season minimizes the damage caused by floodwater.

This association generally is unsuited to dwellings and septic tank absorption fields because of the flooding. It is poorly suited to local roads and streets because of the flooding and the potential for frost action.

3. Moundprairie Association

Silty, poorly drained and very poorly drained soils that formed in alluvium; on flood plains

This association consists of nearly level, frequently flooded soils on flood plains along the Illinois River. Foot slopes and terraces that are not subject to flooding are common near the uplands. Slope ranges from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 65 percent Moundprairie soils and 35 percent minor soils.

Typically, the surface layer of the Moundprairie soils is black, friable, calcareous, silty clay loam about 9 inches thick. The substratum to a depth of 60 inches or more is friable, calcareous, and stratified. In sequence downward, it is black silty clay loam and dark grayish brown silt loam; very dark gray silty clay loam and dark grayish brown silt loam; very dark grayish brown silt loam and dark grayish brown loam; and very dark grayish brown and dark grayish brown silt loam, loam, and loamy sand.

Minor in this association are the Lena, Jasper, and Minneiska soils. The very poorly drained Lena soils formed in calcareous organic material. They are in depressions below the Moundprairie soils. The well drained Jasper soils are not subject to flooding. They are on foot slopes and terraces above the Moundprairie soils. The moderately well drained Minneiska soils are in the slightly higher positions adjacent to tributary streams and on alluvial fans above the Moundprairie soils.

Most areas of this association are wooded. These areas are used for deer and waterfowl hunting. The Moundprairie soils are well suited to this use. They generally are unsuited to cultivated crops because of the flooding. In a few areas, however, corn and soybeans can be grown because a drainage system has been installed. Flooding and wetness are continuing problems in cultivated areas. Where open water is not available, constructing irregularly shaped

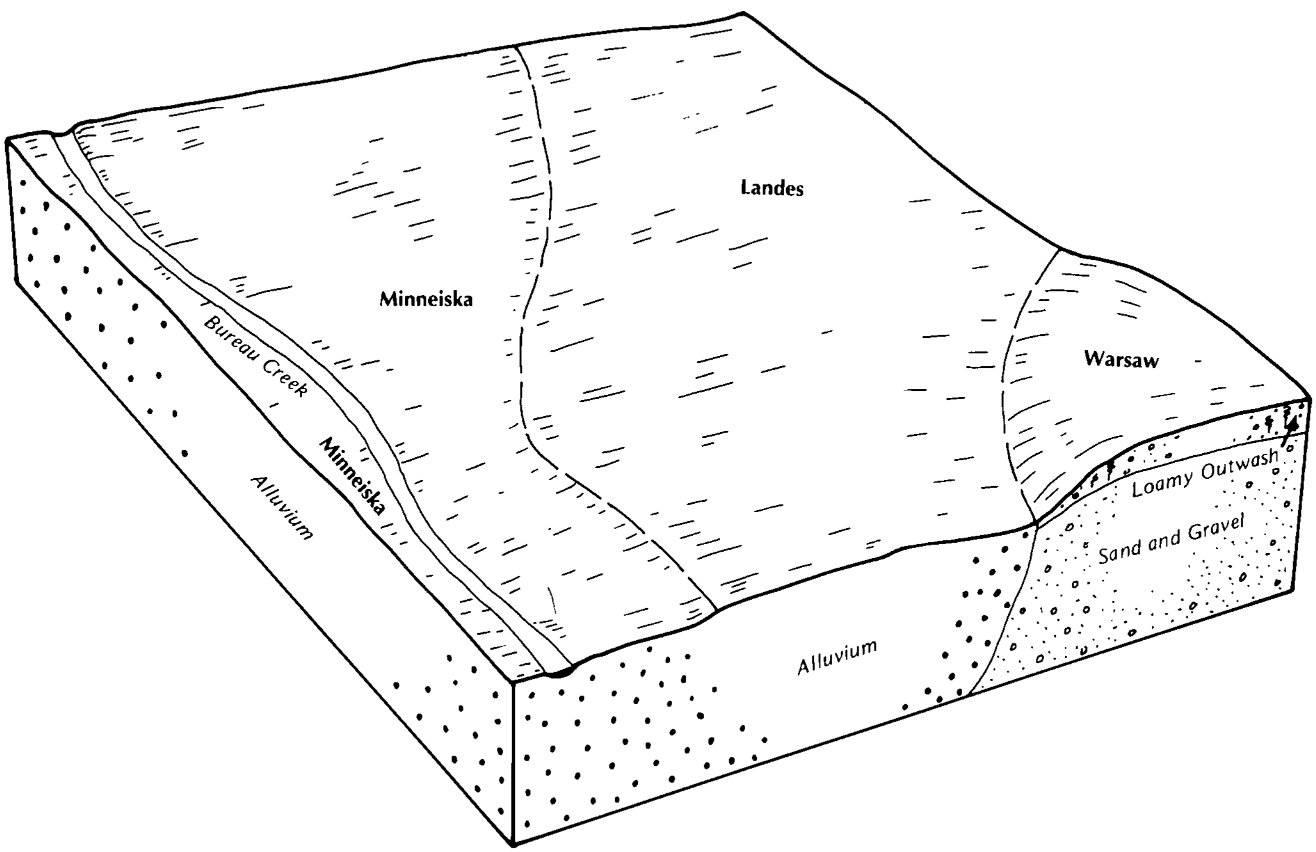


Figure 3.—Typical pattern of soils and parent material in the Minneiska-Landes association.

areas of open water 2 to 4 feet deep can improve the habitat for wetland wildlife if about two-thirds of the area remains vegetated.

This association is moderately suited to woodland. Seedling mortality and the hazard of windthrow are the major management concerns.

This association generally is unsuited to dwellings and septic tank absorption fields because of the flooding. It is poorly suited to local roads and streets because of the flooding and low strength.

Nearly Level Soils That Have a High Water Table

These soils are on outwash plains, on lake plains, and in depressions on moraines. They are used mainly for cultivated crops. Maintenance of surface and subsurface drainage systems is the major management concern.

4. Drummer-Harpster-Selma Association

Silty and loamy, poorly drained soils that formed in loess, lakebed sediments, and glacial outwash; on outwash plains

This association consists mainly of nearly level soils on outwash plains and lake plains. Slight rises and small dunes are in scattered areas throughout the association. Slope ranges from 0 to 2 percent.

This association makes up about 4 percent of the county. It is about 30 percent Drummer and similar soils, 26 percent Harpster and similar soils, 15 percent Selma soils, and 29 percent minor soils.

The silty Drummer soils formed in loess and in the underlying glacial outwash. Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 5 inches thick. The subsoil is about 38 inches thick. It is mottled and friable. The upper part is very dark grayish brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is gray, stratified silty clay loam and clay loam. The substratum to a depth of 60 inches or more is gray, mottled, friable, calcareous, stratified loam, clay loam, and sandy loam.

The silty Harpster soils formed in loess or silty lakebed sediments. Typically, the surface layer is black, friable, calcareous silty clay loam about 8 inches thick. The subsurface layer is also black, friable, calcareous silty clay loam. It is about 10 inches thick. The subsoil is dark gray, friable, calcareous silty clay loam about 14 inches thick. It is mottled in the lower part. The substratum to a depth of 60 inches or more is dark gray, mottled, friable, calcareous silt loam.

The loamy Selma soils formed in glacial outwash. Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer also is black, friable loam. It is about 7 inches thick. The subsoil is about 25 inches thick. It is mottled and friable. The upper part is dark gray silt loam. The lower part is stratified dark gray and grayish brown loam and sandy loam. The substratum to a depth of 60 inches or more is pale brown, mottled, loose sand.

Minor in this association are the Canisteo, Elburn, Joy, and Oakville soils. The poorly drained Canisteo soils have a sandy substratum. They are in landscape positions similar to those of the major soils. The somewhat poorly drained Elburn and Joy soils are slightly higher on the landscape than the major soils. The well drained Oakville soils are on sand dunes above the major soils.

Most areas of this association are cultivated. Because a drainage system has been installed in most areas, the major soils are well suited to cultivated crops. The seasonal high water table is the major limitation. Measures that maintain the drainage system are needed. A high content of lime in the Harpster soils is an additional limitation.

This association generally is unsuited to dwellings and septic tank absorption fields because of ponding and the seasonal high water table. It is poorly suited to local roads and streets because of low strength, wetness, and the potential for frost action.

5. Houghton-Aurelius-Lena Association

Mucky and silty, very poorly drained soils that formed in organic material, in organic material and the underlying marl, or in silty material and the underlying organic material; on moraines, lake plains, and outwash plains

This association consists of nearly level soils in depressions on large lake plains, outwash plains, and moraines. Mineral soils on slight rises are common throughout the association. Slope ranges from 0 to 2 percent.

This association makes up about 1 percent of the county. It is about 33 percent Houghton and similar soils, 20 percent Aurelius soils, 17 percent Lena and similar soils, and 30 percent minor soils.

Typically, the Houghton soils are black muck to a depth of more than 60 inches. The upper part of these soils is very friable, and the lower part is friable.

Typically, the surface layer of the Aurelius soils is black, friable muck about 10 inches thick. The upper part of the substratum is gray and light brownish gray, mottled, friable marl. The next part is mottled grayish brown and yellowish brown, very friable marl. The lower part to a depth of 60 inches or more is dark gray loamy sand.

Typically, the surface layer of the Lena soils is black, friable silt loam about 9 inches thick. The subsurface layer also is black, friable silt loam. It is about 5 inches thick. Below this to a depth of 60 inches or more is black, friable muck.

Minor in this association are the Canisteo and Harpster soils. These poorly drained soils formed in mineral material. They are slightly higher on the landscape than the major soils.

Most areas of this association are cultivated. The major soils are moderately suited to cultivated crops. The seasonal high water table is the major limitation. Properly maintained drainage systems are needed. Soil blowing is a hazard, and subsidence is a limitation. A high content of lime in the Lena soils also is a management concern.

This association generally is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and the subsidence. It is poorly suited to local roads and streets because of low strength, the potential for frost action, and wetness.

Nearly Level to Strongly Sloping Soils That Are Subject to Soil Blowing and Water Erosion and Have a High Water Table

These soils are on outwash plains and moraines. Soil blowing and water erosion are the major management concerns. Wetness is an additional concern in some areas.

6. Waukegan-Sparta-Orio Association

Silty, sandy, and loamy, well drained, excessively drained, and poorly drained soils that formed in loess over sandy material, sandy eolian material, or loamy outwash over sandy material; on outwash plains and moraines

This association consists of nearly level to strongly sloping soils on prominent dunes and ridges and nearly level or gently sloping soils in areas between the dunes. The dunes and ridges generally have short, convex slopes or irregular shapes. Slope ranges from 0 to 20 percent.

This association makes up about 9 percent of the county. It is about 34 percent Waukegan and similar soils, 16 percent Sparta and similar soils, 14 percent Orio and similar soils, and 36 percent minor soils (fig. 4).

The nearly level to sloping, well drained Waukegan soils formed in loess over sandy material. Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer also is very dark brown, friable silt loam. It is about 8 inches thick. The subsoil is about 17 inches thick. It is dark brown and yellowish brown and is friable. The upper part is silt loam. The lower part is sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose sand.

The gently sloping to strongly sloping, excessively drained Sparta soils formed in sandy eolian material. Typically, the surface layer is very dark grayish brown, very friable sand about 9 inches thick. It has been thinned by erosion. The subsoil is about 22 inches thick. It is very friable. The upper part is dark yellowish brown loamy sand. The lower part is yellowish brown sand. The substratum to a depth of 60 inches or more is dark yellowish brown, loose sand.

The nearly level, poorly drained Orio soils formed in loamy outwash over sandy material. Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is dark gray, mottled, friable loam about 13 inches thick. The subsoil is about 18 inches thick. It is gray and mottled. The upper part is friable clay loam. The lower part is very friable sandy loam. The substratum to a depth of 60 inches or more is grayish brown, mottled, loose sand.

Minor in this association are the Drummer, Joy, Lawler, Oakville, Port Byron, and Selma soils. The poorly drained Drummer and Selma soils are on flats and in drainageways below the major soils. The somewhat poorly drained Joy and Lawler soils are in nearly level areas between dunes. The well drained Oakville soils have a light colored surface layer. They are in landscape positions similar to those of the Sparta soils. The moderately well drained Port Byron soils formed in loess over sand and are in landscape positions similar to those of the Waukegan soils.

Most areas of this association are cultivated or are used for pasture. The nearly level to sloping soils are suited to cultivated crops and pasture. The available water capacity is a limitation in all of the major soils, and soil blowing is a hazard in areas of the Orio and Sparta soils. The strongly sloping Sparta soils are poorly suited to pasture and generally are unsuited to cultivated crops because of the slope, soil blowing, and a low available water capacity. Some of the areas used for crops or pasture are irrigated.

The Sparta and Waukegan soils are well suited to dwellings. They are poorly suited to septic tank absorption fields, however, because of a poor filtering capacity in the lower part of the profile. The Orio soils generally are unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and a poor filtering capacity. The Sparta soils are suited to roads and streets, but the Waukegan and Orio soils are poorly suited because of wetness, low strength, and the potential for frost action.

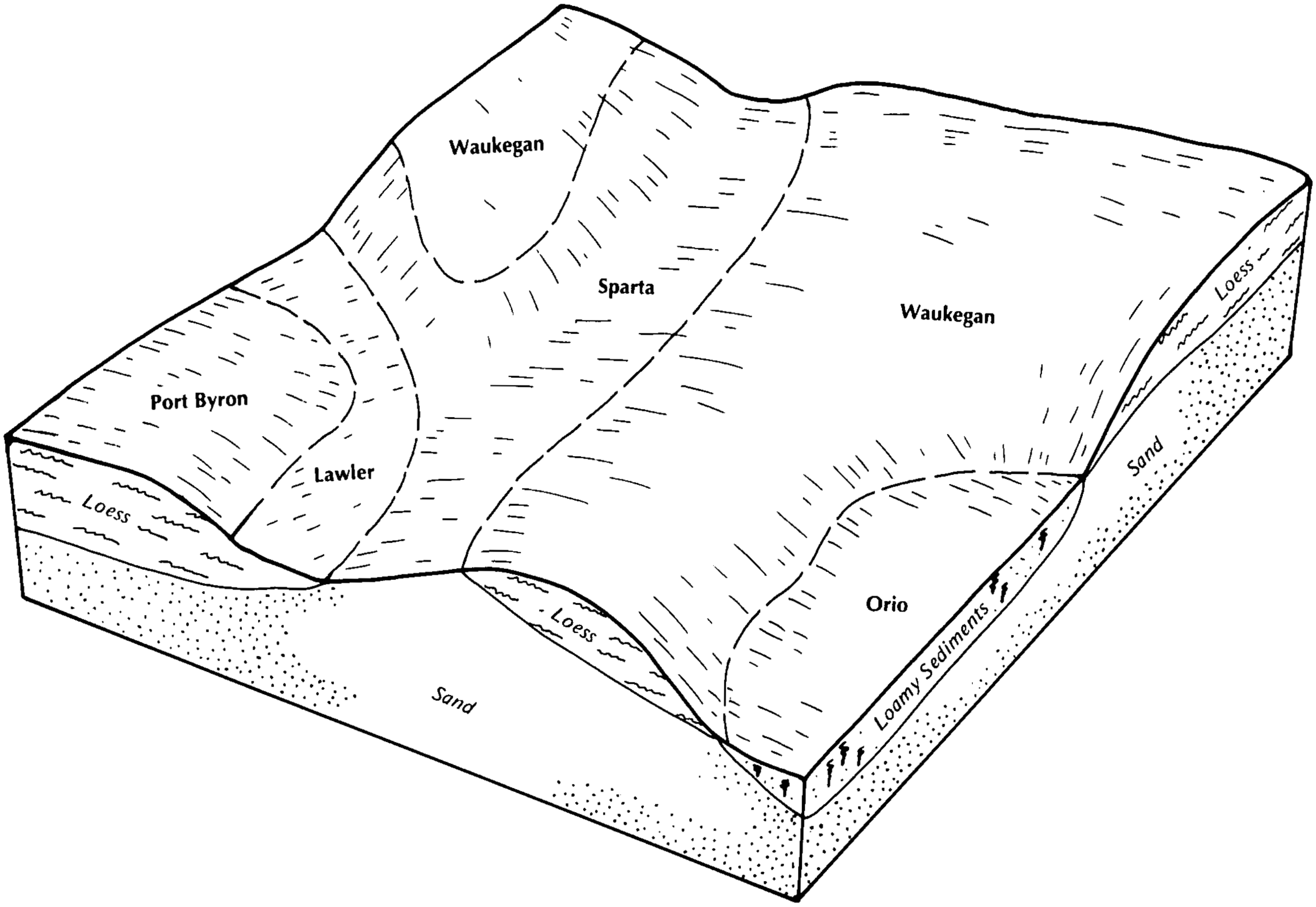


Figure 4.—Typical pattern of soils and parent material in the Waukegan-Sparta-Orio association.

Nearly Level to Sloping Soils That Are Subject to Water Erosion and Have a High Water Table

These soils are on loess-covered till plains, outwash plains, and moraines in the uplands. They are used almost exclusively for cultivated crops. Controlling erosion and maintaining surface and subsurface drainage systems are the major management concerns.

7. Tama-Muscatine-Sable Association

Silty, moderately well drained to poorly drained soils that formed in loess; on uplands

This association consists of nearly level soils on broad flats and gently sloping and sloping soils on ridges and side slopes. Slope ranges from 0 to 10 percent.

This association makes up about 19 percent of the county. It is about 41 percent Tama and similar soils, 30 percent Muscatine soils, 15 percent Sable soils, and 14 percent minor soils (fig. 5).

The moderately well drained Tama soils are on nearly level and gently sloping ridges and sloping side slopes along drainageways. Typically, the surface layer is black, friable silt loam or silty clay loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 31 inches thick. It is friable. The upper part is dark brown silty clay loam. The next part is yellowish brown silty clay loam. The lower part is yellowish brown, mottled silty clay loam and silt loam. The substratum to a depth of 60 inches or more is grayish brown and light olive brown, mottled, friable silt loam.

The nearly level, somewhat poorly drained Muscatine soils are on broad ridges. Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is black, friable silty clay loam about 6 inches thick. The subsoil is about 30 inches thick. It is mottled and friable. The upper part is dark grayish brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is light brownish gray silt loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam.

The nearly level, poorly drained Sable soils are on broad flats and in depressions and drainageways. Typically, the surface layer is black, friable silty clay loam or silt loam about 7 inches thick. The subsurface layer is friable silty clay loam about 10 inches thick. The upper part is black. The lower part is very dark gray. The subsoil is about 26 inches thick. It is grayish brown, mottled, and friable. The upper part is silty clay loam. The lower part is silt loam. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable silt loam.

Minor in this association are the Harpster and Otter soils. The poorly drained Harpster soils are calcareous in the surface layer. They are in depressions below the major soils. The poorly drained Otter soils are on narrow flood plains below the major soils.

Most areas of this association are cultivated. The major soils are suited to cultivated crops. Water erosion is the major hazard in the gently sloping and sloping areas of the Tama soils. The seasonal high water table is the major limitation in areas of the Sable soils. A drainage system has been installed in most areas as needed. Measures that maintain the drainage system are needed.

The Tama soils are moderately suited to dwellings, the Muscatine soils are poorly suited, and the Sable soils generally are unsuited. The shrink-swell potential and the seasonal high water table are the major limitations. Because of the seasonal high water table and ponding, the Tama and Muscatine soils are poorly suited to septic tank absorption fields and the Sable soils are unsuited. All of the soils are poorly suited to local roads and streets because of low strength, the potential for frost action, and wetness.

8. Catlin-Sable Association

Silty, moderately well drained and poorly drained soils that formed in loess and the underlying glacial till or in loess; on uplands

This association consists of nearly level soils on broad flats and in depressions and drainageways and gently sloping and sloping soils on ridges, knolls, and side slopes on moraines and glacial till plains. Depressions and narrow flood plains are in scattered areas throughout the association. Slope ranges from 0 to 10 percent.

This association makes up about 15 percent of the

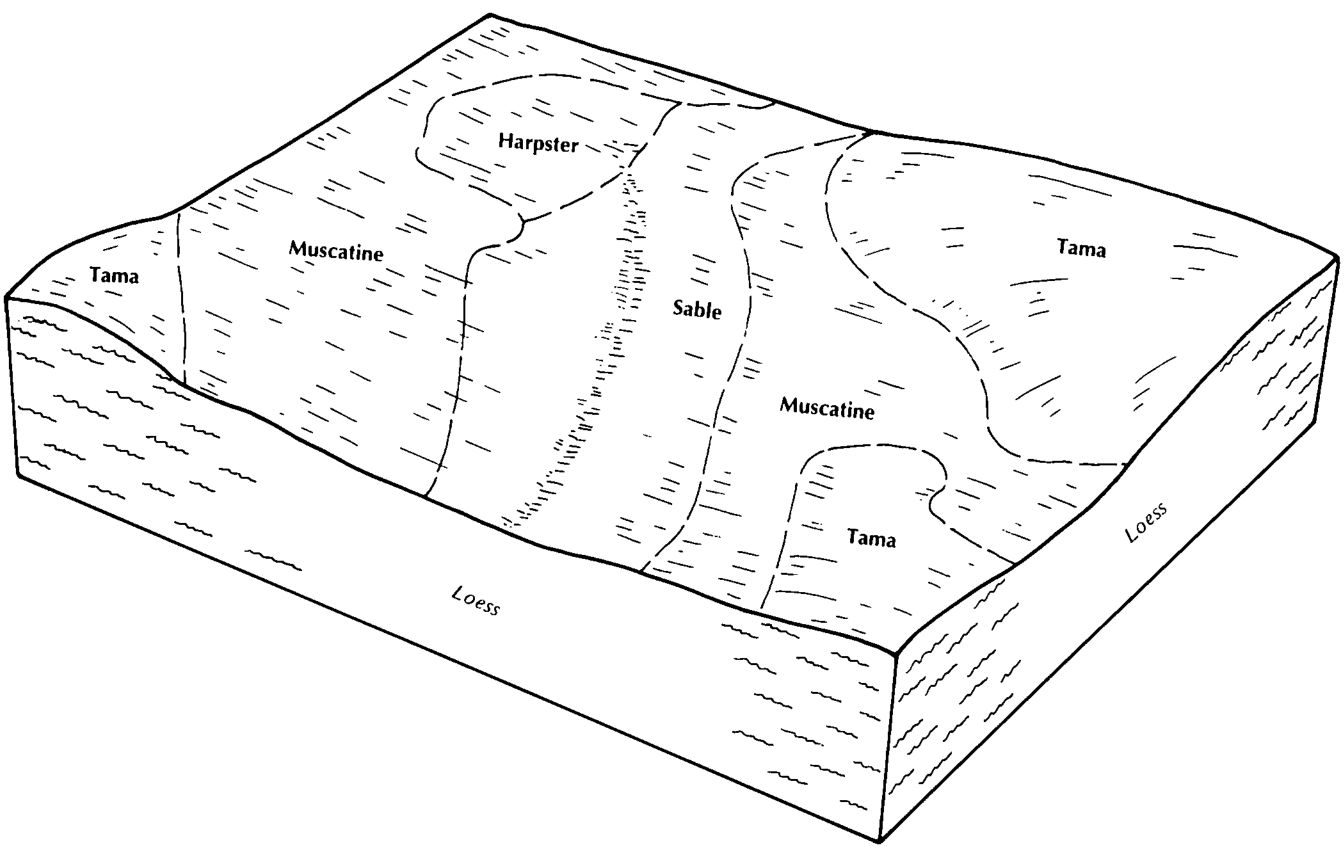


Figure 5.—Typical pattern of soils and parent material in the Tama-Muscatine-Sable association.

county. It is about 49 percent Catlin and similar soils, 20 percent Sable and similar soils, and 31 percent minor soils.

The gently sloping and sloping, moderately well drained Catlin soils formed in loess and in the underlying glacial till. They are on ridges, knolls, and side slopes. Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 39 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is brown, mottled silt loam and loam. The substratum to a depth of 60 inches or more is brown, mottled, friable, calcareous loam.

The nearly level, poorly drained Sable soils formed in loess on broad flats and in depressions and drainageways. Typically, the surface layer is black, friable silty clay loam or silt loam about 7 inches thick. The subsurface layer is friable silty clay loam about 10 inches thick. The upper part is black. The lower part is very dark gray. The subsoil is about 26 inches thick. It is grayish brown, mottled, and friable. The upper part is silty clay loam. The lower part is silt loam. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable silt loam.

Minor in this association are the Flanagan and Muscatine soils. These somewhat poorly drained soils are on broad, low ridges below the Catlin soils and above the Sable soils.

Most areas of this association are cultivated. The major soils are suited to cultivated crops. Water erosion is a hazard in areas of the Catlin soils. A drainage system has been installed in most areas of the Sable soils. Measures that maintain the drainage system are needed.

The Catlin soils are suited to dwellings and septic tank absorption fields. The shrink-swell potential and the seasonal high water table are limitations. The Sable soils are poorly suited to dwellings and generally unsuited to septic tank absorption fields because of ponding and the seasonal high water table. Both soils are poorly suited to local roads and streets because of low strength, the potential for frost action, and wetness.

9. Plano-Elburn-Drummer Association

Silty, well drained, somewhat poorly drained, and poorly drained soils that formed in loess and the underlying glacial outwash; on outwash plains

This association consists of nearly level soils on broad flats and low ridges and gently sloping and sloping soils on ridgetops and side slopes. Slope ranges from 0 to 10 percent.

This association makes up about 8 percent of the county. It is about 40 percent Plano and similar soils, 15 percent Elburn soils, 14 percent Drummer and similar soils, and 31 percent minor soils.

The nearly level to sloping, well drained Plano soils are on ridges and side slopes. Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is brown, mottled silty clay loam and silt loam. The lower part is brown and dark yellowish brown, mottled, stratified silt loam, sandy loam, and loam.

The nearly level, somewhat poorly drained Elburn soils are on low ridges. Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is brown and yellowish brown, friable silty clay loam. The next part is light olive brown, friable silty clay loam and silt loam. The lower part is light olive brown, loose sandy loam.

The nearly level, poorly drained Drummer soils are on broad flats. Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 5 inches thick. The subsoil is about 38 inches thick. It is mottled and friable. The upper part is very dark grayish brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is gray, stratified silty clay loam and clay loam. The substratum to a depth of 60 inches or more is gray, mottled, friable, calcareous, stratified loam, clay loam, and sandy loam.

Minor in this association are the Canisteo, Harpster, Otter, Warsaw, and Waukegan soils. The poorly drained Canisteo and Harpster soils are calcareous in the surface layer. They are in depressions below the major soils. Otter soils are in drainageways below the major soils. The well drained Warsaw and Waukegan soils are sandy within a depth of 40 inches. They are in landscape positions similar to those of the Plano soils.

Most areas of this association are cultivated. The major soils are suited to cultivated crops. Water erosion is the major hazard in the gently sloping and sloping areas of the Plano soils. The seasonal high water table is the major limitation in areas of the Sable soils. A drainage system has been installed in most areas as needed. Measures that maintain the drainage system are needed.

The Plano soils are suited to dwellings and septic tank absorption fields. The Elburn soils are poorly suited to dwellings, and the Sable soils generally are unsuited. The shrink-swell potential and the seasonal high water table are the major limitations. Because of the seasonal high water table and ponding, the Elburn soils are poorly suited to septic tank absorption fields and the Sable soils are unsuited. All of the soils are poorly suited to local roads and streets because of low strength, the potential for frost action, and wetness.

Nearly Level to Very Steep Soils That Are Subject to Water Erosion

These soils are on moraines and till plains. Water erosion is the major management concern.

10. Rozetta-Fayette-Hennepin Association

Silty and loamy, moderately well drained and well drained soils that formed in loess or glacial till; on uplands

This association consists of nearly level and gently sloping soils on ridges and gently sloping to very steep soils on side slopes along drainageways. Slope ranges from 0 to 60 percent.

This association makes up about 19 percent of the county. It is about 35 percent Rozetta and similar soils, 25 percent Fayette and similar soils, 15 percent Hennepin and similar soils, and 25 percent minor soils (fig. 6).

The nearly level and gently sloping, moderately well drained Rozetta soils formed in loess on ridges. Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. The upper part is dark yellowish brown silt loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silty clay loam.

The well drained Fayette soils formed in loess on narrow, gently sloping ridges and on sloping and strongly sloping side slopes. Typically, the surface layer is dark brown, friable silt loam or silty clay loam about 6 inches thick. It has been thinned by erosion in some areas. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable and yellowish brown. The upper part is silty clay loam. The next part is mottled silty clay loam. The lower part is mottled silt loam.

The strongly sloping to very steep, well drained Hennepin soils formed in glacial till on side slopes. Typically, the surface layer is very dark grayish brown, friable loam about 4 inches thick. The subsoil is friable, calcareous loam about 12 inches thick. The upper part is dark brown. The lower part is dark yellowish brown. The substratum to a depth of 60 inches is dark yellowish brown, friable, calcareous loam.

Minor in this association are the Atterberry, Lawson, Lenzburg, Otter, and Radford soils. The nearly level, somewhat poorly drained Atterberry soils are on broad ridges. Lawson, Otter, and Radford soils are on narrow flood plains below the major soils. Lenzburg soils formed in mine spoil in areas that have been surface mined.

Most areas of this association are cultivated. Some are used as woodland. The nearly level to strongly sloping soils are suited to cultivated crops. Water erosion is a hazard. The major soils are suited to woodland. Water erosion, the equipment limitation, and plant competition are management concerns.

The nearly level to strongly sloping soils in this association are suited to dwellings and septic tank absorption fields, but the steep and very steep soils are unsuited. The slope, the seasonal high water table, the shrink-swell potential, and restricted permeability are limitations. Some combination of these limits urban development in all areas. All of the major soils are poorly suited to local roads and streets because of the slope, low strength, and the potential for frost action.

11. Saybrook-Parr-La Rose Association

Silty and loamy, well drained soils that formed in loess and the underlying glacial till or in glacial till; on uplands

This association consists of nearly level to strongly sloping soils on moraines. Shallow depressions and drainageways are common. Slope ranges from 2 to 15 percent.

This association makes up about 9 percent of the county. It is about 30 percent Saybrook soils, 15 percent Parr soils, 15 percent La Rose and similar soils, and 40 percent minor soils (fig. 7).

The silty, gently sloping and sloping Saybrook soils formed in loess and in the underlying glacial till. Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer also is very dark brown, friable silt loam. It is about 6 inches thick. The subsoil is about 22 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The lower part is dark brown clay loam. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam.

The silty, gently sloping and sloping Parr soils formed in glacial till. Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. It is friable. The upper part is dark yellowish brown and

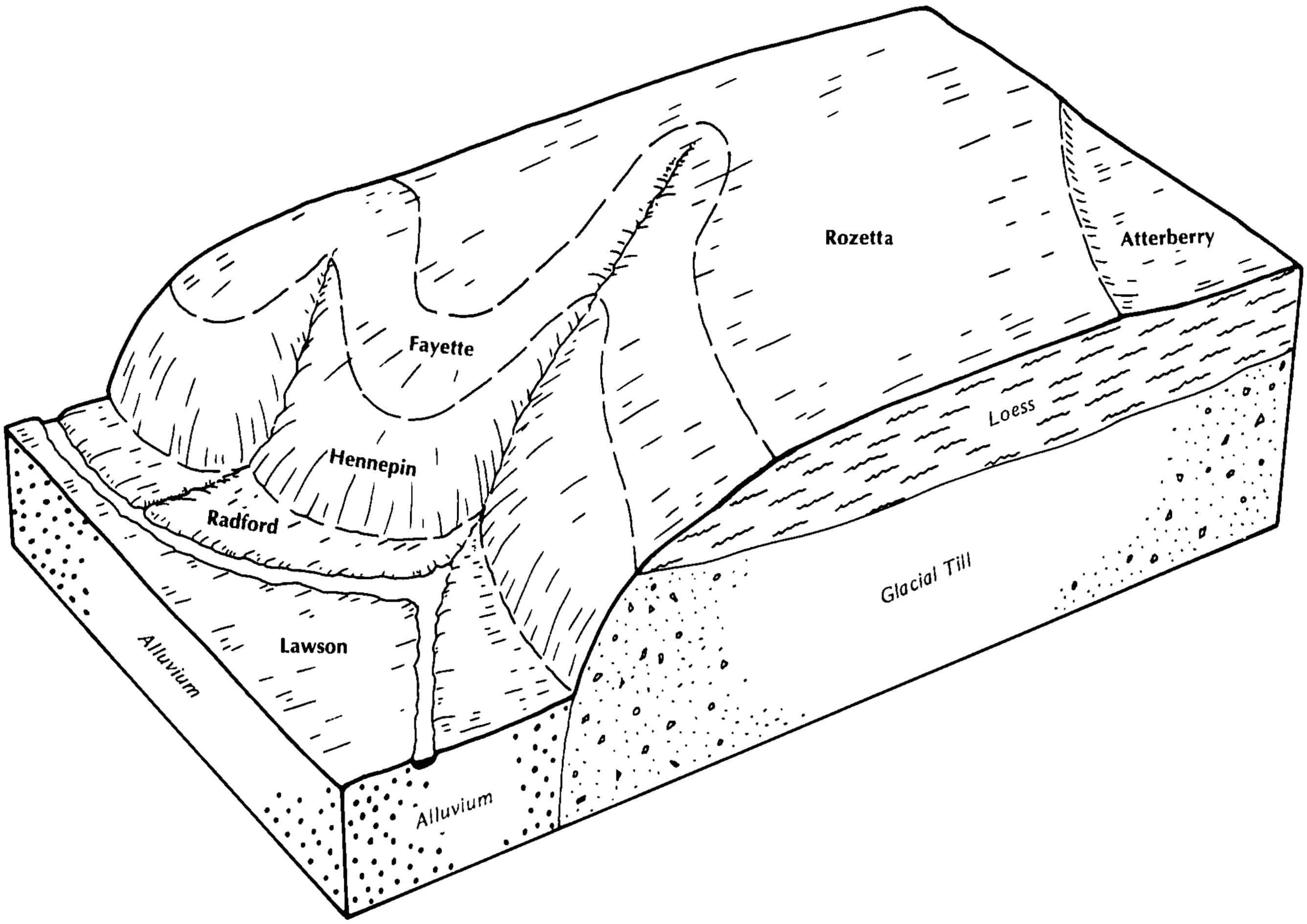


Figure 6.—Typical pattern of soils and parent material in the Rozetta-Fayette-Hennepin association.

brown clay loam. The lower part is brown, calcareous loam. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam.

The loamy, sloping and strongly sloping La Rose soils formed in glacial till. Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam or loam about 7 inches thick. In many areas it has been thinned by erosion. The subsoil is about 13 inches thick. It is friable. The upper part is dark yellowish brown clay loam. The lower part is brown, calcareous loam. The substratum to a depth of 60 inches or more is brown, friable and firm, calcareous loam.

Minor in this association are the Drummer, Elburn, Flanagan, Lisbon, Otter, Warsaw, and Waukegan soils. The poorly drained Drummer soils are in drainageways and depressions below the major soils. The somewhat poorly drained Elburn, Flanagan, and Lisbon soils are on toe slopes and ridges, generally below the major soils. Otter soils are on narrow flood plains below the major soils. Warsaw and Waukegan soils are sandy within a depth of 40 inches. They are in landscape positions similar to those of the major soils.

Most areas of this association are cultivated. The major soils are suited to cultivated crops. Water erosion is a hazard.

This association is suited to dwellings and septic tank absorption fields. The slope and the shrink-swell potential are limitations that can be easily overcome. The association is poorly suited to local roads and streets because of low strength and the potential for frost action.

12. Tama-Elkhart-Port Byron Association

Silty, moderately well drained and well drained soils that formed in loess; on uplands

This association consists of nearly level to strongly sloping soils on ridges and side slopes in the uplands. Slope ranges from 0 to 15 percent.

This association makes up about 9 percent of the county. It is about 72 percent Tama and similar soils, 10 percent Elkhart and similar soils, 10 percent Port Byron soils, and 8 percent minor soils.

The Tama soils are nearly level to sloping and are moderately well drained. Typically, the surface layer is black, friable silt loam or silty clay loam about 9 inches thick. In some areas it has been thinned by erosion. The subsurface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 31 inches thick. It is friable. The upper part is dark brown silty clay loam. The next part is yellowish brown silty clay loam. The lower part is yellowish brown, mottled silty clay loam and silt loam. The substratum to a depth of 60 inches or more is grayish brown and light olive brown, mottled, friable silt loam.

The Elkhart soils are sloping and strongly sloping and are well drained. Typically, the surface layer is mixed dark brown and brown, friable silt loam or silty clay loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. It is friable. The upper part is brown silty clay loam. The lower part is yellowish brown silty clay loam and silt loam. The substratum to a depth of 60 inches or more is brownish yellow, friable, calcareous silt loam.

The Port Byron soils are nearly level to sloping and are moderately well 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 5 inches thick. The subsoil to a depth of more than 60 inches is friable silt loam. The upper part is dark brown. The next part is yellowish brown. The lower part is yellowish brown and mottled.

Minor in this association are the Muscatine, Otter, and Radford soils. The somewhat poorly drained Muscatine soils are on low, broad ridges. Otter and Radford soils are on narrow flood plains below the major soils.

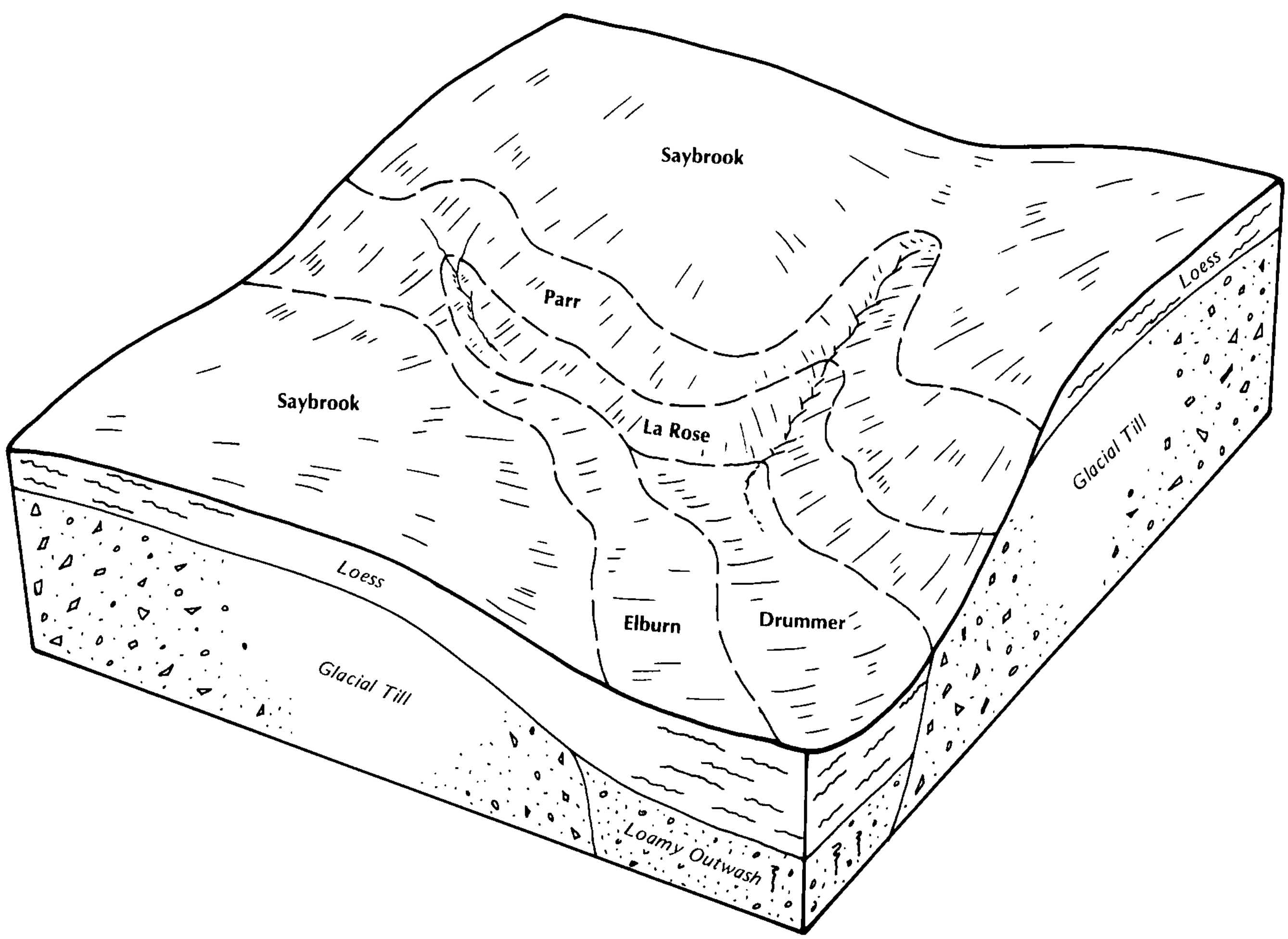


Figure 7.—Typical pattern of soils and parent material in the Saybrook-Parr-La Rose association.

Most areas of this association are cultivated. The major soils are suited to cultivated crops. Water erosion is a hazard.

This association is suited to dwellings and septic tank absorption fields. The slope, the shrink-swell potential, the seasonal high water table, and restricted permeability are limitations. The association is poorly suited to local roads and streets because of low strength, the slope, and the potential for frost action.

Detailed Soil Map Units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and 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, Tama silt loam, 2 to 5 percent slopes, is a phase of the Tama 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. Hennepin-Casco complex, 12 to 25 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. 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 Henry, Lee, La Salle, and Putnam Counties, some map units join with similar map units that have a different name in Bureau County. Also, some of the map units in the adjacent counties join map units in Bureau County that have the same soil name but have different slope or erosion classes. These differences result from variations in the extent of the soils or from 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

8D3—Hickory clay loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable clay loam about 4 inches thick. The subsoil is friable clay loam about 37 inches thick. The upper part is yellowish brown. The lower part is brown. The substratum to a depth of 60 inches or more is brown, calcareous clay loam. In some areas the surface layer is darker and thicker and is silt loam. In other areas the subsoil is thinner. In places the soil contains more silt and less sand throughout.

Included with this soil in mapping are small areas of the well drained Marseilles and somewhat poorly drained Radford soils. Marseilles soils are moderately deep over weathered shale bedrock. They are on side slopes below the Hickory soil. Radford soils are in drainageways below the Hickory soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. In cultivated areas surface runoff is rapid. The available water capacity is high. Organic matter content is low. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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.

In areas used as pasture, seeding and renovating on the contour, deferring grazing, stocking at a proper rate, applying fertilizer, and applying a system of rotation grazing help to control erosion, increase forage production, and prevent surface compaction. No-till seeding helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Mulching helps to control erosion.

The moderate permeability and slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is IVe.

8F—Hickory silt loam, 18 to 35 percent slopes. This steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 4 inches thick. The subsoil is about 50 inches thick. The upper part is dark yellowish brown, friable silty clay loam. The next part is dark yellowish brown, friable and firm clay loam. The lower part is dark brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, calcareous clay loam. In some areas, the subsoil is thinner and carbonates are within a depth of 40 inches. In other areas the subsoil contains less sand.

Included with this soil in mapping are small areas of Marseilles and Radford soils. The somewhat poorly drained Radford soils are in drainageways below the Hickory soil. The moderately deep Marseilles soils are on side slopes below the Hickory soil. Included soils make up 5 to 15 percent of the unit.

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

Most areas are used as pasture or support native timber. This soil is unsuited to cultivated crops and poorly suited to hay because of the slope and the erosion hazard. It is moderately suited to pasture. It is well suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition restricts the growth of desirable seedlings. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Mulching helps to control erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The land capability classification is VIe.

19D—Sylvan silt loam, 10 to 18 percent slopes. This strongly sloping, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsurface layer is mixed dark grayish brown and brown, friable silt loam about 5 inches thick. The subsoil is about 30 inches thick. It is friable. The upper part is brown silty clay loam. The next part is dark yellowish brown silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is light yellowish brown, mottled, calcareous silt loam. In some areas the lower part of the subsoil and the substratum are not calcareous. In other areas the substratum contains more sand or till pebbles.

Included with this soil in mapping are small areas of somewhat poorly drained, slowly permeable soils on side slopes below the Sylvan soil. Also included are areas of the somewhat poorly drained Radford soils; areas of the well drained Hennepin, Hickory, and Miami soils; and small areas of soils that are calcareous throughout. Radford soils are in narrow drainageways below the Sylvan soil. Hennepin, Hickory, and Miami soils are in landscape positions similar to those of the Sylvan soil. They have more sand throughout than the Sylvan soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Sylvan soil at a moderate rate. Surface runoff is rapid. The available water capacity is very high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or hay. Some areas support native timber. This soil is moderately suited to cultivated crops and dwellings. It is well suited to woodland. It is poorly suited to septic tank absorption fields.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in the areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and erosion is a hazard. The shrink-swell potential is a limitation on sites for dwellings without basements. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The land capability classification is IIIe.

19D3—Sylvan silty clay loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes along drainageways on dissected uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 7 inches thick. The subsoil is about 30 inches thick. It is yellowish brown and friable. The upper part is silty clay loam. The lower part is silt loam. The substratum to a depth of 60 inches or more is brownish yellow and light brownish gray, calcareous silt loam. In places the surface layer is darker and thicker. In some areas the substratum is not calcareous. In other areas it contains more sand or till pebbles.

Included with this soil in mapping are small areas of somewhat poorly drained, slowly permeable soils on side slopes below the Sylvan soil. Also included are areas of the somewhat poorly drained Radford soils; areas of the well drained Hennepin, Hickory, and Miami soils; and small areas of soils that are calcareous throughout. Radford soils are in narrow drainageways below the Sylvan soil. Hennepin, Hickory, and Miami soils are in landscape positions similar to those of the Sylvan soil. They have more sand throughout than the Sylvan soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Sylvan soil at a moderate rate. Surface runoff is rapid. The available water capacity is very high. Organic matter content is low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or hay. Some areas support native timber. This soil is poorly suited to cultivated crops and septic tank absorption fields. It is well suited to woodland. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and erosion is a hazard. The shrink-swell potential is a limitation on sites for dwellings without basements. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The land capability classification is IVe.

19G—Sylvan silt loam, 30 to 60 percent slopes. This very steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or 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 5 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 3 inches thick. The subsoil is about 22 inches thick. It is yellowish brown. The upper part is friable silt loam and silty clay loam. The next part is firm silty clay loam. The lower part is firm, calcareous silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, firm, calcareous silt loam. In some areas the soil contains more sand throughout. In other areas the subsoil is calcareous throughout and contains less clay. In a few areas the lower part of the subsoil and the substratum are not calcareous.

Included with this soil in mapping are small areas of the well drained Hennepin and Miami soils. These soils are in landscape positions similar to those of the Sylvan soil. They have more sand throughout than the Sylvan soil. Also included are small areas of less sloping soils that are calcareous throughout. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Sylvan soil at a moderate rate. Surface runoff is very rapid. The available water capacity is very high. Organic matter content is low. The shrink-swell potential is moderate, and the potential for frost action is high.

This soil is well suited to woodland wildlife habitat. It is moderately suited to paths and trails. It is poorly suited to woodland. It generally is unsuited to cultivated crops, septic tank absorption fields, and dwellings because of the slope.

In areas used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Seedling mortality is high. Plant competition restricts the growth of desirable seedlings. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. Planting mature nursery stock and clearing all vegetation within 2 feet of the planted seedlings reduce the seedling mortality rate. Some replanting may be necessary. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

The land capability classification is VIIe.

24B—Dodge silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on the tops of ridges in the uplands. 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 6 inches thick. The subsoil is about 34 inches thick. The upper part is yellowish brown, friable silty clay loam. The lower part is brown, firm clay loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the calcareous, loamy substratum is closer to the surface. In other areas it is farther from the surface. In a few places the seasonal high water table is 4 to 6 feet below the surface during the spring.

Water and air move through this soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 40 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. The shrink-swell potential is a limitation on sites for dwellings without basements. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIe.

24C2—Dodge silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil is about 25 inches thick. The upper part is yellowish brown, friable silty clay loam. The lower part is brown, firm clay loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In a few places the plow layer is yellowish brown silty clay loam. In some areas the loamy, calcareous material is closer to the surface. In other areas it is farther from the surface. In a few areas the seasonal high water table is 4 to 6 feet below the surface during the spring.

Included with this soil in mapping are small areas of soils that have loamy, calcareous material at the surface. These soils make up 2 to 5 percent of the unit.

Water and air move through the Dodge soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 31 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to hay, pasture, and dwellings with basements. It is moderately suited to cultivated crops, to dwellings without basements, to septic tank absorption fields, and to woodland.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIIe.

24D2—Dodge silt loam, 10 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 25 acres in size.

Typically, the surface layer is mixed brown and yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 30 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, firm silty clay loam and silt loam. The lower part is strong brown and brown, mottled, firm, calcareous clay loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In a few places the plow layer is yellowish brown silty clay loam. In some areas the calcareous, loamy material is closer to the surface. In other areas it is farther from the surface. In a few areas the seasonal high water table is 4 to 6 feet below the surface during the spring.

Included with this soil in mapping are small areas of soils that have loamy, calcareous material at the surface. These soils make up 2 to 5 percent of the unit.

Water and air move through the Dodge soil at a moderate rate. In cultivated areas surface runoff is rapid. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 38 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and erosion is a hazard. The shrink-swell potential is a limitation on sites for dwellings without basements. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is IVe.

25G—Hennepin loam, 30 to 60 percent slopes. This very steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow and range from 3 to 350 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 4 inches thick. The subsoil is friable, calcareous loam about 12 inches thick. The upper part is dark brown. The lower part is dark yellowish brown. The substratum to a depth of 60 inches or more is dark brown, friable, calcareous loam. In some areas the surface layer has been removed by water erosion. In other areas the loamy, calcareous material is farther from the surface.

Included with this soil in mapping are small areas of the somewhat excessively drained Casco, well drained Fayette, and moderately well drained Minneiska and Rozetta soils. Casco soils have stratified sand and gravel within a depth of 24 inches. They are upslope from the Hennepin soil. Fayette and Rozetta soils contain less sand and more clay throughout than the Hennepin soil. They are in the less sloping areas. Minneiska soils contain less clay throughout than the Hennepin soil. They are on flood plains below the Hennepin soil. Also included are a few seepy spots on hillsides, at the contact point of the sand and gravel and the underlying loamy, calcareous glacial till. The seepy spots support wetland vegetation and have accumulations of organic material.

Water and air move through the Hennepin soil at a moderate rate. Surface runoff is very rapid. The available water capacity is moderate. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 16 inches. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are used for woodland wildlife habitat. This soil is well suited to woodland wildlife habitat and is moderately suited to woodland. It generally is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the slope.

In areas used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition restricts the growth of desirable seedlings. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

The land capability classification is VIIe.

27C2—Miami silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes along drainageways in the uplands. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is mixed dark brown and yellowish brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. The upper part is yellowish brown, friable silty clay loam. The next part is strong brown, firm clay loam. The lower part is brown, firm, calcareous loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the depth to calcareous, loamy glacial till is more than 40 inches. In other areas the seasonal high water table is within a depth of 4 feet during the spring.

Included with this soil in mapping are small areas of soils that are calcareous at the surface. These soils make up 2 to 5 percent of the unit.

Water and air move through the upper part of the Miami soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 32 inches. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome this limitation.

The land capability classification is IIIe.

27D2—Miami silt loam, 10 to 18 percent slopes, eroded. This strongly sloping, well drained soil is along drainageways in the uplands. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is mixed yellowish brown and dark brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil is about 22 inches thick. The upper part is yellowish brown, friable silty clay loam. The lower part is brown clay loam and loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the depth to loamy, calcareous glacial till is more than 40 inches. In other areas the seasonal high water table is within a depth of 4 feet during the spring. In places the slope is less than 10 percent.

Included with this soil in mapping are small areas of soils that are calcareous at the surface. These soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Miami soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is rapid. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 28 inches. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that is dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and the shrink-swell potential are limitations and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is IVe.

27F—Miami silt loam, 18 to 35 percent slopes. This steep, well drained soil is on side slopes along drainageways 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, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 29 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is dark yellowish brown clay loam. The lower part is dark brown, calcareous loam. The substratum to a depth of 60 inches or more is dark brown, friable, calcareous loam. In some areas, the subsoil is thinner and the calcareous loam is within a depth of 20 inches. In other areas the depth to calcareous loam is more than 40 inches. In places the substratum is stratified and contains more sand.

Included with this soil in mapping are small areas of the moderately well drained Birkbeck, excessively drained Casco, and moderately well drained Minneiska soils. Birkbeck soils are in the less sloping areas on side slopes above the Miami soil. Casco soils have strata of sand and gravel within a depth of 24 inches. They are upslope from the Miami soil. Minneiska soils contain less clay throughout than the Miami soil. They are on narrow flood plains below the Miami soil. Also included are seepy spots on hillsides, at the contact point of the sand and gravel and the underlying loamy, calcareous glacial till. The seepy spots support wetland vegetation and have accumulations of organic material. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Miami soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is rapid. The available water capacity is high. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of 40 inches. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for hay or pasture, water erosion is a hazard, particularly during establishment. Seeding of the pasture or hayland, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

In areas used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition restricts the growth of desirable seedlings. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and the shrink-swell potential are limitations and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is VIe.

36A—Tama silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on 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 4 inches thick. The subsoil is about 31 inches thick. It is friable. The upper part is dark brown silty clay loam. The next part is yellowish brown silty clay loam. The lower part is yellowish brown, mottled silty clay loam and silt loam. The substratum to a depth of 60 inches or more is grayish brown and light olive brown, mottled, friable silt loam. In some areas the substratum is calcareous and is within a depth of 40 inches. In other areas depth to the seasonal high water table is less than 4 feet.

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

Water and air move through the Tama soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to dwellings and septic tank absorption fields.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is I.

36B—Tama silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 150 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer also is very dark brown, friable silt loam. It is about 8 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. The upper part is dark brown silty clay loam. The next part is grayish brown and brown, mottled silty clay loam. The lower part is grayish brown, mottled silt loam. In some areas the surface soil is thinner. In other areas the seasonal high water table is 2 to 4 feet below the surface during the spring.

Included with this soil in mapping are small areas of the poorly drained Edgington, Otter, and Sable soils. Edgington and Sable soils are in shallow depressions below the Tama soil. Otter soils are on narrow flood plains below the Tama soil. Included soils make up 4 to 10 percent of the unit.

Water and air move through the Tama soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIe.

36B2—Tama silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on uplands. Individual areas are irregular in shape and range from 3 to 2,000 acres in size.

Typically, the surface layer is mixed very dark grayish brown and yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 43 inches thick. It is friable. The upper part is yellowish brown silty clay loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is dark yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is dark yellowish brown, mottled, friable silt loam. In some areas the surface soil is thicker. In other areas the seasonal high water table is 2 to 4 feet below the surface during the spring.

Included with this soil in mapping are small areas of the poorly drained Edgington, Otter, and Sable soils. Edgington and Sable soils are in depressions below the Tama soil. Otter soils are on narrow flood plains below the Tama soil. Included soils make up 4 to 10 percent of the unit.

Water and air move through the Tama soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIe.

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

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 33 inches thick. It is friable. The upper part is dark yellowish brown silt loam and silty clay loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the surface soil is thicker. In other areas the lower part of the subsoil and the substratum contain more sand. In places the substratum is calcareous within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Otter soils on narrow flood plains below the Tama soil. Also included are a few small areas of soils that are calcareous at the surface. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Tama soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. 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.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIIe.

36C3—Tama silty clay loam, 5 to 10 percent slopes, severely eroded. This sloping, moderately well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is mixed yellowish brown and dark brown, friable silty clay loam about 7 inches thick. The subsoil is about 30 inches thick. It is mottled and friable. The upper part is yellowish brown silty clay loam. The lower part is yellowish brown silt loam. The substratum to a depth of 60 inches or more is mottled, friable silt loam. The upper part is yellowish brown. The lower part is light brownish gray and is calcareous. In some areas the surface soil is thicker. In other areas the lower part of the subsoil and the substratum contain more sand. In places the substratum is calcareous within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Otter soils. These soils are on narrow flood plains below the Tama soil. Also included are small areas of soils that are calcareous at the surface. Included areas make up 2 to 5 percent of the unit.

Water and air move through the Tama soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is low. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is poorly suited to cultivated crops. It is moderately suited to hay, pasture, dwellings, and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that is dominated by grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IVe.

41—Muscatine silt loam. This nearly level, somewhat poorly drained soil is on broad ridges and in broad, low areas in the uplands. Individual areas are irregular in shape and range from 5 to 500 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 6 inches thick. The subsoil is about 30 inches thick. It is mottled and friable. The upper part is dark grayish brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is light brownish gray silt loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam. In some areas the substratum is calcareous within a depth of 40 inches. In other areas depth to the seasonal high water table is more than 4 feet.

Included with this soil in mapping are small areas of the poorly drained Edgington and Sable soils. These soils are in shallow depressions below the Muscatine soil. They make up 2 to 10 percent of the unit.

Water and air move through the Muscatine soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 2 to 4 feet below the surface during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table is a limitation during some years. Subsurface drains have been installed in many areas and can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation 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 curtain drains and either mounding or raising the site with suitable fill material help to overcome this limitation.

The land capability classification is I.

59—Lisbon silt loam. This nearly level, somewhat poorly drained soil is on narrow flats on moraines. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 10 inches thick. The subsurface layer also is black, friable silt loam. It is about 3 inches thick. The subsoil is about 23 inches thick. It is brown and friable. The upper part is silty clay loam. The next part is mottled silty clay loam. The lower part is mottled, calcareous clay loam. The substratum to a depth of 60 inches or more is brown, mottled, firm, calcareous loam. In some areas the lower part of the subsoil has thin layers of loamy sand. In other areas the soil contains more sand throughout. In places the soil does not have calcareous loam glacial till within a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Drummer, Pella, and Sable and well drained Parr and Saybrook soils. Drummer, Pella, and Sable soils are in shallow depressions and drainageways below the Lisbon soil. Parr and Saybrook soils are higher on the landscape than the Lisbon soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Lisbon soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 36 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table is a limitation during some years. Subsurface drains have been installed in many areas and can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The seasonal high water table is a limitation on sites for dwellings. The shrink-swell potential also is a limitation on sites for dwellings without basements. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is I.

60C2—La Rose silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes on moraines. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is about 13 inches thick. It is friable. The upper part is dark yellowish brown clay loam. The lower part is brown, calcareous loam. The substratum to a depth of 60 inches or more is brown, friable and firm, calcareous loam. In some areas the subsoil is thicker. In other areas the surface soil is thicker. In places the surface layer is clay loam.

Included with this soil in mapping are small areas of the well drained Ayr soils and a few small areas of soils that have calcareous gravel or sand in the substratum. Ayr soils are sandy in the upper part. Both of the included soils are in landscape positions similar to those of the La Rose soil. They make up 2 to 10 percent of the unit.

Water and air move through the La Rose soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 20 inches. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. 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.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, conserve moisture, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIIe.

60C3—La Rose clay loam, 5 to 10 percent slopes, severely eroded. This sloping, well drained soil is on side slopes on moraines. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is mixed dark brown and brown, friable clay loam about 6 inches thick. The subsoil is brown, friable clay loam about 9 inches thick. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas, the surface layer is silt loam and the subsoil is thicker. In other areas the depth to calcareous loam glacial till is more than 40 inches or the glacial till is at the surface.

Included with this soil in mapping are small areas of the well drained Ayr soils and areas of soils that have calcareous gravel or sand in the substratum. Ayr soils are sandy in the upper part. Both of the included soils are in landscape positions similar to those of the La Rose soil. They make up 2 to 10 percent of the unit.

Water and air move through the La Rose soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is low. The surface layer is friable but becomes hard and cloddy if tilled when wet. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 15 inches. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is poorly suited to cultivated crops. It is moderately suited to hay, pasture, septic tank absorption fields, and dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, conserve moisture, minimize crusting, and maintain tilth and fertility. A crop rotation that is dominated by grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IVe.

60D2—La Rose silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes on glacial moraines. Individual areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is brown, friable clay loam about 5 inches thick. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the surface soil is thicker. In other areas the depth to calcareous loam glacial till is more than 40 inches. In places the surface soil is clay loam.

Included with this soil in mapping are small areas of soils that have calcareous gravel or sand in the substratum. These soils are in landscape positions similar to those of the La Rose soil. They make up 5 to 10 percent of the unit.

Water and air move through the La Rose soil at a moderate rate. In cultivated areas surface runoff is rapid. The available water capacity is moderate. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 12 inches. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is poorly suited to cultivated crops. It is moderately suited to hay, pasture, septic tank absorption fields, and dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, conserve moisture, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The moderate permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is IIIe.

60D3—La Rose clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes on glacial moraines. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is mixed dark brown and brown, friable clay loam about 7 inches thick. The subsoil is brown, friable clay loam about 4 inches thick. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam. In some areas, the surface layer is silt loam and the subsoil is thicker. In other areas the surface layer is lighter in color.

Included with this soil in mapping are small areas of soils that have calcareous gravel or sand in the substratum. These soils are in landscape positions similar to those of the La Rose soil. They make up 5 to 10 percent of the unit.

Water and air move through the La Rose soil at a moderate rate. In cultivated areas surface runoff is rapid. The available water capacity is moderate. Organic matter content is low. The surface layer is friable but becomes hard and cloddy if tilled when wet. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 11 inches. The shrink-swell potential and the potential for frost action are moderate.

Most areas are cultivated. This soil is poorly suited to cultivated crops. It is moderately suited to hay, pasture, septic tank absorption fields, and dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, conserve moisture, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The moderate permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome these limitations.

The land capability classification is IVe.

61—Atterberry silt loam. This nearly level, somewhat poorly drained soil is on stream terraces and till plains. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is mottled, friable silt loam about 8 inches thick. The upper part is light brownish gray, and the lower part is brown. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is brown, firm silty clay loam. The next part is grayish brown, friable silty clay loam. The lower part is light brownish gray, friable silty clay loam and silt loam. In some areas the surface layer is light in color. In other areas the subsurface layer is darker. In places depth to the seasonal high water table is more than 4 feet.

Included with this soil in mapping are small areas of the poorly drained Edgington and Sable soils. These soils are in shallow depressions below the Atterberry soil. They make up 2 to 10 percent of the unit.

Water and air move through the Atterberry soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table is a limitation during some years. Subsurface drains have been installed in many areas and can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is I.

67—Harpster silty clay loam. This nearly level, poorly drained soil is on broad flats on outwash plains, lake plains, and till plains. It is ponded for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 1,000 acres in size.

Typically, the surface layer is black, friable, calcareous silty clay loam about 8 inches thick. The subsurface layer also is black, friable, calcareous silty clay loam. It is about 10 inches thick. The subsoil is dark gray, friable, calcareous silty clay loam about 14 inches thick. It is mottled in the lower part. The substratum to a depth of 60 inches or more is dark gray, mottled, friable, calcareous silt loam. In some areas the soil contains more sand or less clay throughout. In other areas the substratum is sand or loamy sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in landscape positions similar to those of the Harpster soil. They are not calcareous within a depth of 40 inches. Also included are small areas of soils that have sand and gravel within a depth of 40 inches and small areas of soils that are ponded throughout most of the growing season. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Harpster soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to septic tank absorption fields and dwellings because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation during some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. A high content of lime in this soil is a limitation. It interferes with the uptake of phosphorus and potassium and reduces the effectiveness of applied herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. The rate of herbicide application should be adjusted to compensate for the soil reaction. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

68—Sable silty clay loam. This nearly level, poorly drained soil is in drainageways, in depressions, and on broad flats in the uplands. It is ponded for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 1,000 acres in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is friable silty clay loam about 10 inches thick. The upper part is black. The lower part is very dark gray. The subsoil is about 26 inches thick. It is grayish brown, mottled, and friable. The upper part is silty clay loam. The lower part is silt loam. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable silt loam. In some areas the lower part of the subsoil and the substratum contain more sand. In other areas the surface soil is thicker and contains less clay. In places the soil is calcareous within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Harpster and somewhat poorly drained Muscatine soils. Harpster soils are calcareous throughout. They are in landscape positions similar to those of the Sable soil. Muscatine soils are on low ridges above the Sable soil. Also included are areas of soils in deep depressions that are ponded throughout most of the growing season. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Sable soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to septic tank absorption fields and dwellings because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation during some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

68+—Sable silt loam, overwash. This nearly level, poorly drained soil is in depressions on moraines. It is ponded for brief periods from March through June. Individual areas are oval and range from 3 to 50 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is about 16 inches thick. It is black and friable. The upper part is silt loam, and the lower part is silty clay loam. The subsoil is friable silty clay loam about 26 inches thick. The upper part is very dark gray. The lower part is gray. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable silt loam. In some areas the surface layer contains more sand. In other areas organic material is below the subsurface layer. In some places the lower part of the subsoil and the substratum are marl. In other places the soil is calcareous within a depth of 40 inches.

Included with this soil in mapping are small areas of soils that have a calcareous surface layer. These soils are in landscape positions similar to those of the Sable soil. Also included are a few areas of soils in deep depressions that are ponded throughout most of the growing season. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Sable soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to septic tank absorption fields and dwellings because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation during some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

73—Ross silt loam. 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 grayish brown, friable silt loam about 8 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 12 inches thick. The subsoil is about 27 inches thick. The upper part is very dark grayish brown, friable silt loam. The next part is dark brown, friable loam. The lower part is dark brown, very friable, calcareous sandy loam. The substratum to a depth of 60 inches or more is dark yellowish brown, loose, calcareous, stratified sandy loam and loamy sand. In some areas the soil contains more sand throughout. In other areas it is gravelly within a depth of 40 inches. In places it is calcareous throughout.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson, occasionally flooded Minneiska, and somewhat poorly drained Lawson soils. Dickinson soils have more sand in the surface soil and subsoil than the Ross soil. They are in the higher positions on terraces and are not subject to flooding. Minneiska soils are lower on the landscape than the Ross soil. Lawson soils are in old stream channels and are slightly lower on the landscape than the Ross soil. Included soils make up 2 to 10 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 moderately rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to septic tank absorption fields but is unsuited to dwellings because of the hazard of flooding.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is I.

74—Radford silt loam. This nearly level, somewhat poorly drained soil is on flood plains and in narrow drainageways. It is occasionally flooded for brief periods from March through June. Individual areas are long and narrow and range from 3 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 12 inches thick. The underlying material extends to a buried soil at a depth of about 29 inches. This material is very dark gray and brown, friable, stratified silt loam and silty clay loam. The buried soil to a depth of 60 inches or more is black, mottled, friable silty clay loam. In some areas the soil contains more sand throughout. In other areas it does not have a buried soil within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Otter soils in the slightly lower positions on flood plains. Also included are a few small areas of soils that are calcareous at the surface. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Radford soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It generally is unsuited to septic tank absorption fields and dwellings because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed and the soil is adequately protected from flooding. In some areas, however, the seasonal high water table is a limitation during some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. The brief periods of flooding can delay planting in some years. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

76—Otter silt loam. This nearly level, poorly drained soil is on flood plains. It is occasionally flooded and ponded for brief periods from March through June. Individual areas are long and narrow and range from 5 to 1,000 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is friable silt loam about 27 inches thick. The upper part is black. The next part is very dark gray. The lower part is black and mottled. The subsoil is light brownish gray, mottled, friable silt loam about 10 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam. In some areas the subsoil contains more sand. In other areas the substratum contains more sand. In a few areas the surface soil and substratum contain more clay.

Included with this soil in mapping are small areas of soils that are calcareous throughout. Also included are a few small areas of soils in depressions that are ponded for long periods throughout the growing season. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Otter soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to septic tank absorption fields and dwellings because of the seasonal high water table and the occasional flooding.

Corn and soybeans can be grown in most areas because a drainage system has been installed and the soil is adequately protected from flooding. In some areas, however, the seasonal high water table is a limitation during some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. The brief periods of flooding can delay planting in some years. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

87A—Dickinson sandy loam, 0 to 2 percent slopes. This nearly level, somewhat excessively drained soil is on low dunes on uplands, stream terraces, and outwash plains. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is very dark brown, very friable sandy loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, very friable sandy loam about 12 inches thick. The subsoil is about 27 inches thick. It is very friable. The upper part is dark brown sandy loam. The next part is yellowish brown loamy sand. The lower part is yellowish brown sand. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface soil and subsoil contain more sand. In other areas they contain less sand and more clay. In places the substratum is loam or silt loam.

Included with this soil in mapping are small areas of the very poorly drained Gilford, somewhat poorly drained Hoopeston, and poorly drained Selma soils. Gilford and Selma soils are lower on the landscape than the Dickinson soil. Hoopeston soils are slightly lower on the landscape than the Dickinson soil. Included 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 at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is low. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to septic tank absorption fields. It is well suited to dwellings. It is a probable source of sand.

In areas used for corn, soybeans, or small grain, soil blowing is a hazard and the low available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to control soil blowing and conserves moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

87B2—Dickinson sandy loam, 2 to 7 percent slopes, eroded. This gently sloping, somewhat excessively drained soil is on dunes on uplands, stream terraces, and outwash plains. Individual areas are long and narrow or irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is dark brown, very friable sandy loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 23 inches thick. It is very friable. The upper part is brown sandy loam. The next part is dark yellowish brown sandy loam. The lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface soil is thicker. In other areas the surface layer and subsoil contain more sand. In a few areas they contain less sand and more clay. In places the substratum is loam or silt loam.

Included with this soil in mapping are small areas of the very poorly drained Gilford, somewhat poorly drained Hoopeston, and poorly drained Selma soils. Gilford and Selma soils are in depressions below the Dickinson soil. Hoopeston soils are slightly lower on the landscape than the Dickinson soil. Included 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 at a rapid rate. In cultivated areas surface runoff is medium. The available water capacity is low. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is moderately suited to cultivated crops. It is well suited to hay and pasture. It is poorly suited to septic tank absorption fields. It is well suited to dwellings. It is a probable source of sand.

In areas used for corn, soybeans, or small grain, further soil blowing and water erosion are hazards and the low available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and soil blowing and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIe.

87D2—Dickinson sandy loam, 7 to 15 percent slopes, eroded. This strongly sloping, somewhat excessively drained soil is on dunes on uplands, stream terraces, and outwash plains. Individual areas are long and narrow, crescent shaped, or irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark brown, friable sandy loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 32 inches thick. It is friable. The upper part is dark brown sandy loam. The next part is yellowish brown sandy loam. The lower part is yellowish brown loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface layer and subsoil contain more sand. In other areas the surface soil is thicker. In places the surface layer and subsoil contain less sand and more clay. In a few areas the substratum is loam or silt loam.

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. In cultivated areas surface runoff is medium. The available water capacity is low. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are used as pasture. This soil is poorly suited to cultivated crops and septic tank absorption fields. It is moderately suited to dwellings and to hay and pasture. It is a probable source of sand.

In areas used for corn, soybeans, or small grain, further soil blowing and water erosion are hazards and the low available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and soil blowing and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. A crop rotation that includes grasses and legumes helps to control erosion and soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazards of erosion and soil blowing.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank and land leveling help to overcome these limitations.

The land capability classification is IVe.

88B2—Sparta sand, 1 to 7 percent slopes, eroded. This gently sloping, excessively drained soil is on dunes on stream terraces, outwash plains, and moraines. Individual areas are long and narrow, crescent shaped, or irregular in shape and range from 3 to 120 acres in size.

Typically, the surface layer is mixed very dark grayish brown and yellowish brown, very friable sand about 8 inches thick. It has been thinned by erosion. The subsoil is yellowish brown, very friable sand about 22 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface layer is light colored. In other areas the subsoil contains more clay.

Included with this soil in mapping are small areas of the poorly drained Orio and well drained Waukegan soils. These soils are less droughty than the Sparta soil. Orio soils are in depressions below the Sparta soil. Waukegan soils are in landscape positions similar to those of the Sparta soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Sparta soil at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is low. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are low.

Most areas are cultivated. This soil is poorly suited to cultivated crops, hay, pasture, woodland, and septic tank absorption fields. It is moderately suited to coniferous woodland. It is well suited to dwellings. It is a probable source of sand.

In areas used for corn, soybeans, or small grain, further soil blowing and water erosion are hazards and the low available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and soil blowing and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of 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, and 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IVs.

88D2—Sparta sand, 7 to 20 percent slopes, eroded. This strongly sloping, excessively drained soil is on dunes on stream terraces, outwash plains, and moraines. Individual areas are long and narrow, crescent shaped, or irregular in shape and range from 3 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sand about 9 inches thick. It has been thinned by erosion. The subsoil is about 22 inches thick. It is very friable. The upper part is dark yellowish brown loamy sand. The lower part is yellowish brown sand. The substratum to a depth of 60 inches or more is dark yellowish brown, loose sand. In some areas the surface layer is lighter in color. In other areas the surface layer and subsoil contain more clay.

Included with this soil in mapping are small areas of the poorly drained Orio soils and well drained Waukegan soils. These soils are less droughty than the Sparta soil. Orio soils are in depressions below the Sparta soil. Waukegan soils are in landscape positions similar to those of the Sparta soil. Included soils make up as much as 10 percent of the unit.

Water and air move through the Sparta soil at a rapid rate. Surface runoff is slow. The available water capacity is low. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are low.

Most areas are used as pasture. This soil is unsuited to cultivated crops because of droughtiness and the slope. It is poorly suited to hay, pasture, and septic tank absorption fields. It is moderately suited to coniferous woodland and to dwellings. It is a probable source of sand.

In the areas used for hay or pasture, further soil blowing and water erosion are hazards and the low available water capacity is a limitation, particularly during establishment. Seeding of the pasture or hayland, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control soil blowing and water erosion. Planting drought-resistant species of grasses and legumes can help in establishing a plant cover. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of 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, and 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. Establishing wildlife food plots and additional cover is difficult because of the low available water capacity and low fertility. Drought-resistant plant species can be used for wildlife cover. Measures that protect the habitat from fire and from grazing by livestock are essential.

If this soil is used as a site for dwellings, the slope is a limitation and soil blowing and water erosion are hazards. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established helps to control soil blowing and erosion.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Land shaping and installing a sealed sand filter and a disinfection tank help to overcome these limitations.

The land capability classification is VIIs.

93B—Rodman gravelly sandy loam, 2 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on eskers, moraines, stream terraces, and outwash plains. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark brown gravelly sandy loam about 7 inches thick. The subsoil is dark brown, very friable gravelly sandy loam about 3 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown, loose, calcareous very gravelly sand. In places the surface layer is thinner.

Included with this soil in mapping are small areas of the well drained Warsaw soils. These soils are in landscape positions similar to those of the Rodman soil. They have more clay and less sand and gravel in the surface layer and subsoil than the Rodman soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Rodman soil at a moderately rapid rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity is very low. Organic matter content is moderate. The shrink-well potential and the potential for frost action are low.

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

In areas used for corn, soybeans, or small grain, soil blowing is a hazard and the very low available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to control soil blowing and conserves moisture.

Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of the very 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, and 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IVs.

93D—Rodman gravelly sandy loam, 7 to 15 percent slopes. This strongly sloping, somewhat excessively drained soil is on eskers, moraines, stream terrace breaks, and outwash plains. Individual areas are long and narrow or irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable gravelly sandy loam about 7 inches thick. The subsoil is dark brown, friable gravelly sandy loam about 7 inches thick. The substratum to a depth of 60 inches or more is calcareous, loose, and single grain. The upper part is dark brown gravelly loamy sand. The lower part is yellowish brown very gravelly sand. In some areas the calcareous sand and gravel are at the surface.

Included with this soil in mapping are small areas of the well drained Warsaw soils. These soils have more clay and less sand and gravel in the surface layer and subsoil than the Rodman soil. They are upslope from the Rodman soil. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Rodman soil at a moderately rapid rate and through the lower part at a very rapid rate. Surface runoff is medium. The available water capacity is very low. Organic matter content is moderate. The shrink-swell potential and the potential for frost action are low.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard and the very low available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, grassed waterways, and a crop rotation that includes grasses and legumes help to control erosion and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of the very 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, and 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.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Land shaping and installing a sealed sand filter and a disinfection tank help to overcome these limitations.

The land capability classification is IVs.

102—La Hogue loam. This nearly level, somewhat poorly drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 9 inches thick. The subsurface layer also is very dark grayish brown, friable loam. It is about 6 inches thick. The subsoil is about 34 inches thick. It is friable and mottled. The upper part is very dark grayish brown and dark brown clay loam. The lower part is yellowish brown and grayish brown loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable, stratified loam and loamy sand. In some areas the surface layer and the subsoil have less sand. In other areas, they have less sand and the stratified material is within a depth of 40 inches. In places the soil is calcareous within a depth of 40 inches.

Included with this soil in mapping are small areas of

the well drained Jasper and poorly drained Selma soils. Jasper soils are slightly higher on the landscape than the La Hogue soil. Selma soils are slightly lower on the landscape than the La Hogue soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the La Hogue soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface in spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table may delay planting during some years. Subsurface drains can function satisfactorily if suitable outlets are available and if filtering material is installed to keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The seasonal high water table is a limitation on sites for dwellings and septic tank absorption fields. Subsurface drains around foundations can help to remove excess water from building sites. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness in septic tank absorption fields.

The land capability classification is I.

103—Houghton muck. This nearly level, very poorly drained soil is in depressions on outwash plains and moraines. It is ponded for brief periods from March through June. Individual areas are oval and range from 3 to 600 acres in size.

Typically, this soil is black muck to a depth of 60 inches or more. The upper part is very friable, and the lower part is friable. In some areas the soil is calcareous in the lower part. In other areas the subsurface material is sedimentary peat. In some places the organic material is thinner and is underlain by sandy or loamy material. In other places the muck is overlain by more than 16 inches of mineral material.

Included with this soil in mapping are small areas of the poorly drained Canisteo soils. These soils are slightly higher on the landscape than the Houghton soil. They formed entirely in mineral material. Also included are small areas of undrained soils that are ponded throughout most of the growing season. Included soils 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. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 1 foot above the surface to 1 foot below during winter and spring. The available water capacity is very high. Organic matter content also is very high. The potential for frost action is high. The rate of subsidence in areas that are drained and cultivated is about 1 foot in 10 years because of accelerated decomposition.

Most areas are cultivated. This soil is moderately suited to cultivated crops, hay, and pasture. It generally is unsuited to dwellings and septic tank absorption fields because of low strength, the seasonal high water table, ponding, and subsidence.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Soil blowing is a hazard. Measures that maintain or improve the drainage system may be needed. Surface drains can function satisfactorily if suitable outlets are available. Subsurface drains do not function so well, however, because the soil is subject to subsidence. Installing subsurface drains with long sections of perforated tubing helps to prevent the damage caused by subsidence. Applying a system of conservation tillage that leaves crop residue on the surface after planting and planting cover crops and field windbreaks help to control soil blowing.

The land capability classification is IIIw.

104—Virgil silt loam. This nearly level, somewhat poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 5 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled and friable. The upper part is dark brown silty clay loam. The next part is brown silty clay loam. The lower part is grayish brown and light brownish gray silty clay loam and loam. In some areas the surface layer is lighter in color. In other areas loamy, stratified material is below a depth of 60 inches.

Included with this soil in mapping are small areas of the well drained Batavia, Camden, and St. Charles soils. These soils are higher on the landscape than the Virgil soil. They make up 5 to 10 percent of the unit.

Water and air move through the Virgil soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table may delay planting during some years. Subsurface drains can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation 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 curtain drains and either mounding or raising the site with suitable fill material help to overcome this limitation.

The land capability classification is I.

105A—Batavia 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 25 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 more than 60 inches. It is yellowish brown. The upper part is friable silty clay loam. The next part is mottled, friable silty clay loam and loam. The lower part is very friable, stratified sandy loam and loamy sand. In some places the surface soil is thicker. In other places the lower part of the subsoil contains less sand. In some areas the surface layer is lighter in color. In other areas stratified, loamy material is within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn soils. These soils are slightly lower on the landscape than the Batavia soil. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Batavia soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

105B—Batavia silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on till plains, 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 very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is mixed brown and very dark grayish brown, friable silt loam about 3 inches thick. The subsoil is about 40 inches thick. It is friable. The upper part is brown silt loam. The next part is yellowish brown silty clay loam and silt loam. The lower part is yellowish brown, mottled loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, very friable loam. In some areas the surface layer is thicker. In other areas the lower part of the subsoil and the substratum contain less sand. In some places stratified, loamy material is within a depth of 40 inches. In other places the surface layer is lighter in color.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and Virgil soils. These soils are slightly lower on the landscape than the Batavia soil. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Batavia soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

105C2—Batavia silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown and dark yellowish brown, friable silt loam about 10 inches thick. It has been partially mixed by tillage with the upper part of the subsoil. The subsoil extends to a depth of more than 60 inches. The upper part is dark yellowish brown and yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silt loam that has strata of sandy loam. In some areas the lower part of the subsoil has less sand. In other areas the surface layer is thicker. In places stratified silt loam and sandy loam are within a depth of 40 inches.

Included with this soil in mapping are small areas of the excessively drained Rodman and Sparta soils. These soils are in landscape positions similar to those of the Batavia soil. They have more gravel and sand throughout than the Batavia soil. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Batavia soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

125—Selma loam. This nearly level, poorly drained soil is on outwash plains and stream terraces. It is ponded for brief periods from March through June. Individual areas are irregular in shape and range from 20 to 1,000 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 7 inches thick. The subsoil is about 25 inches thick. It is mottled and friable. The upper part is dark gray silt loam. The lower part is stratified dark gray and grayish brown loam and sandy loam. The substratum to a depth of 60 inches or more is pale brown, mottled, loose sand. In some areas the upper part of the subsoil contains less clay and more sand. In other areas the surface layer and subsoil contain less sand.

Included with this soil in mapping are small areas of the poorly drained Canisteo and Harpster, somewhat poorly drained Joy, and very poorly drained Aurelius soils. Canisteo and Harpster soils are in landscape positions similar to those of the Selma soil. They have a calcareous surface layer and subsoil. Joy soils are higher on the landscape than the Selma soil. Aurelius soils are lower on the landscape than the Selma soil. They have a mucky surface layer and are underlain by marl. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Selma soil at a moderate rate and through the lower part at a moderately rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The land capability classification is IIw.

134A—Camden 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 3 to 25 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 41 inches thick. It is friable. The upper part is yellowish brown silty clay loam. The next part is yellowish brown and strong brown clay loam. The lower part is strong brown sandy clay loam and sandy loam. The substratum to a depth of 60 inches is brown, loose sandy loam that has strata of loamy sand. In some areas the surface layer is darker. In other areas the soil is deeper to stratified, loamy material. In places calcareous gravel is below a depth of 40 inches. In a few areas the upper part of the subsoil contains more sand. In some areas the soil is moderately well drained and has a seasonal high water table within a depth of 6 feet during the spring.

Included with this soil in mapping are small areas of the somewhat poorly drained Virgil and well drained Tell soils. Virgil soils are slightly lower on the landscape than the Camden soil. Tell soils are in landscape positions similar to those of the Camden soil and are in the more sloping areas. Also included are a few areas of soils that have gravel within a depth of 40 inches. Included soils make up 2 to 5 percent of the unit.

Water and air move through the upper part of the Camden soil at a moderate rate and through the lower part at a moderately rapid rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, dwellings with basements, and septic tank absorption fields. It is moderately suited to dwellings without basements and to woodland.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

134B—Camden silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on outwash plains and stream terraces. Individual areas are oblong or irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is light brownish gray, friable silt loam about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is yellowish brown and friable. The upper part is silty clay loam. The next part is mottled clay loam. The lower part is mottled, stratified sandy loam, silt loam, sandy clay loam, and sand. In some areas the lower part of the subsoil is not stratified and contains less sand. In other areas it contains more gravel. In a few areas the soil is more sloping and is moderately eroded. In places it has a seasonal high water table within a depth of 6 feet during the spring.

Included with this soil in mapping are small areas of soils that have sand and gravel within a depth of 40 inches. These soils are in landscape positions similar to those of the Camden soil. They make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Camden soil at a moderate rate and through the lower part at a moderately rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, pasture, dwellings with basements, and septic tank absorption fields. It is moderately suited to dwellings without basements and to woodland.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

134C2—Camden silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, friable silt loam. The next part is yellowish brown, friable silty clay loam. The lower part is dark yellowish brown, friable loam and sandy loam. The substratum to a depth of 60 inches or more is dark brown, very friable sandy loam that has strata of loamy sand. In some places the surface layer contains more clay. In other places the loamy and sandy material is below a depth of 60 inches. In some areas the substratum contains more gravel.

Included with this soil in mapping are small areas of soils that have sand and gravel within a depth of 40 inches. These soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Camden soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops, woodland, and dwellings without basements. It is well suited to pasture, hay, dwellings with basements, and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

145B—Saybrook silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on moraines. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer also is very dark brown, friable silt loam. It is about 6 inches thick. The subsoil is about 22 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The lower part is dark brown clay loam. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam. In some areas the subsoil contains more sand. In other areas the calcareous loam till is within a depth of 24 inches or below a depth of 48 inches. In some places the surface soil is thinner. In other places the subsoil has thin layers of loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and Lisbon, well drained Waukegan, and poorly drained Sable soils. Elburn and Lisbon soils are lower on the landscape than the Saybrook soil. Waukegan soils are in landscape positions similar to those of the Saybrook soil. They have a sandy substratum. Sable soils are in depressions that are ponded for brief periods. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Saybrook soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 36 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIe.

145B2—Saybrook silt loam, 2 to 5 percent slopes, eroded. This gently sloping, well drained soil is on moraines. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 23 inches thick. It is friable. The upper part is brown and dark yellowish brown silty clay loam. The next part is dark yellowish brown, mottled silt loam. The lower part is brown clay loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the subsoil contains more sand. In other areas the calcareous loam till is within a depth of 24 inches. In some places the surface soil is thicker. In other places the subsoil has thin layers of loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and Lisbon, well drained Waukegan, and poorly drained Sable soils. Elburn and Lisbon soils are lower on the landscape than the Saybrook soil. Waukegan soils are in landscape positions similar to those of the Saybrook soil. They have a sandy substratum. Sable soils are in depressions that are ponded for brief periods. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Saybrook soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 31 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIe.

145C2—Saybrook silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on convex slopes on moraines. 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 9 inches thick. It has been thinned by erosion. The subsoil is about 27 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is yellowish brown silty clay loam and silt loam. The lower part is strong brown clay loam. The substratum to a depth of 60 inches or more is brown, firm, calcareous loam. In some areas the subsoil contains more sand. In other areas the calcareous loam till is within a depth of 24 inches. In some places the surface soil is thicker. In other places the subsoil has thin layers of loamy sand.

Included with this soil in mapping are small areas of the well drained Waukegan soils. These soils are in landscape positions similar to those of the Saybrook soil. Also included are soils that are calcareous at the surface. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Saybrook soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat limited by massive, loamy glacial till below a depth of about 36 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings 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 helps to overcome this limitation.

The land capability classification is IIIe.

149—Brenton silt 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 60 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is friable silt loam about 10 inches thick. The upper part is black, and the lower part is very dark grayish brown. The subsoil is about 25 inches thick. It is mottled and friable. The upper part is brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is dark yellowish brown, stratified sandy loam, loam, and silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable, calcareous, stratified sandy loam and loamy sand. In some areas the stratified, loamy and sandy material is below a depth of 40 inches. In other areas the substratum is sand. In places calcareous gravel is within a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Pella and Drummer and well drained Waukegan soils. Pella and Drummer soils are lower on the landscape than the Brenton soil. Waukegan soils are higher on the landscape than the Brenton soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Brenton soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table can delay planting. Subsurface drains can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation 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 curtain drains and either mounding or raising the site with suitable fill material help to overcome this limitation.

The land capability classification is I.

152—Drummer silty clay loam. This nearly level, poorly drained soil is in drainageways and on broad flats on outwash plains. It is ponded for brief periods from March through June. Individual areas are irregular in shape and range from 20 to 400 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 5 inches thick. The subsoil is about 38 inches thick. It is mottled and friable. The upper part is very dark grayish brown silty clay loam. The next part is grayish brown silty clay loam. The lower part is gray, stratified silty clay loam and clay loam. The substratum to a depth of 60 inches or more is gray, mottled, friable, calcareous, stratified loam, clay loam, and sandy loam. In some areas the stratified, loamy material is below a depth of 60 inches or within a depth of 40 inches. In other areas the surface soil and subsoil contain more sand. In some places the substratum is sandy. In other places the surface soil is thicker and is silt loam in the upper part.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and poorly drained Harpster soils. Elburn soils are slightly higher on the landscape than the Drummer soil. Harpster soils are in landscape positions similar to those of the Drummer soil. They have a calcareous surface layer and subsoil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Drummer soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

153—Pella silty clay loam. This nearly level, poorly drained soil is on outwash plains. It is ponded from March through June. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer also is black, friable silty clay loam. It is about 15 inches thick. It is mottled in the lower part. The subsoil is about 27 inches thick. It is grayish brown, mottled, and friable. The upper part is silty clay loam. The lower part is calcareous, stratified silt loam and loam. The substratum to a depth of 60 inches or more is dark grayish brown, mottled, calcareous, stratified silt loam and sandy loam. In some areas the subsoil is not calcareous. In other areas the surface soil and subsoil contain more sand. In some places the substratum is calcareous silt loam. In other places it contains more sand. In some areas stratified, loamy material is below a depth of 40 inches.

Included with this soil in mapping are small areas of undrained soils that are ponded for long periods during the growing season. These soils are in depressions below the Pella soil. They make up 2 to 5 percent of the unit.

Water and air move through the Pella soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to septic tank absorption fields and dwellings because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

154—Flanagan silt loam. This nearly level, somewhat poorly drained soil is on till plains. 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 also is very dark gray, friable silt loam. It is about 5 inches thick. The subsoil is about 45 inches thick. It is friable and mottled. The upper part is dark brown and brown silty clay loam. The lower part is grayish brown and light brownish gray silt loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, firm loam. In some areas the lower part of the subsoil and the substratum contain more sand. In other areas the substratum contains less sand and clay. In places the seasonal high water table is below a depth of 3 feet.

Included with this soil in mapping are small areas of the poorly drained Harpster and well drained Plano and Saybrook soils. Harpster soils are calcareous throughout. They are slightly lower on the landscape than the Flanagan soil. Plano soils contain more sand in the lower part of the subsoil and in the substratum than the Flanagan soil. Also, they are slightly higher on the landscape. Saybrook soils have a subsoil that is thinner than that of the Flanagan soil. They are on ridges above the Flanagan soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Flanagan soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity and organic matter content are high. The shrink-swell potential and the potential for frost action also are high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table may delay planting during some years. Subsurface drains can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The moderately slow permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The land capability classification is I.

171B2—Catlin silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on moraines. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 39 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is brown, mottled silt loam and loam. The substratum to a depth of 60 inches or more is brown, mottled, friable, calcareous loam. In some areas the surface layer is thicker. In other areas the lower part of the subsoil and the substratum have less sand. In some places the calcareous, loamy material is within a depth of 40 inches. In other places the seasonal high water table is within a depth of 3.5 feet in spring. In some areas the lower part of the subsoil and the substratum are stratified. In places the soil is severely eroded and has more clay in the surface layer.

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

Water and air move through the Catlin soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 3.5 to 6.0 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The moderate permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIe.

171C2—Catlin silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on convex ridgetops and knolls and on uneven side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface layer is mixed very dark grayish brown and yellowish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 46 inches thick. It is friable. The upper part is yellowish brown silty clay loam. The next part is yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is dark yellowish brown, mottled, calcareous clay loam. In some areas the loamy substratum is within a depth of 40 inches. In other areas the lower part of the subsoil and the substratum have less sand. In some places they are stratified. In other places the seasonal high water table is within a depth of 3.5 feet in spring. In a few areas the soil is severely eroded and has more clay in the surface layer.

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

Water and air move through the Catlin soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 3.5 to 6.0 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The moderate permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIe.

172—Hoopeston loam. This nearly level, somewhat poorly drained soil is on outwash plains. Individual areas are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface layer is very dark gray, friable loam about 10 inches thick. The subsurface layer is dark brown, friable sandy loam about 6 inches thick. The subsoil is about 18 inches thick. It is mottled and very friable. The upper part is dark brown sandy loam. The lower part is pale brown loamy sand. The substratum to a depth of 60 inches or more is pale brown, mottled, and loose. The upper part is stratified loamy sand and sandy loam. The lower part is fine sand. In some areas the subsoil contains more clay and less sand. In other areas it contains more sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and poorly drained Selma soils. Dickinson soils are higher on the landscape than the Hoopeston soil. Selma soils are slightly lower on the landscape than the Hoopeston soil. They occasionally are ponded. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Hoopeston soil at a moderately rapid rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, soil blowing is a hazard and the moderate available water capacity is a limitation. The seasonal high water table can delay planting in some years. A conservation tillage system that leaves crop residue on the surface after planting, cover crops, and field windbreaks help to control soil blowing and conserve moisture. Because of the limited available water capacity, irrigation may be advantageous. A drainage system is needed in some areas. Subsurface drains can function satisfactorily if suitable outlets are available and if filtering material is installed to keep sand from clogging tile lines.

The seasonal high water table is a limitation on sites for dwellings. Subsurface drains around foundations can help to remove excess water. Enclosing the drains with filtering material can keep sand from clogging tile drains.

The seasonal high water table and a poor filtering capacity are limitations on sites for septic tank absorption fields. Curtain drains can remove excess water from around the absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

175B—Lamont fine sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces, outwash plains, and moraines. Individual areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is mixed dark grayish brown and yellowish brown, very friable fine sandy loam about 9 inches thick. The subsoil extends to a depth of about 39 inches. It is yellowish brown and very friable. The upper part is fine sandy loam. The lower part is loamy fine sand that has dark brown bands. The lower part of the profile to a depth of 60 inches or more consists of alternating layers of yellowish brown, loose fine sand and dark brown loamy fine sand and fine sandy loam. In some areas the subsoil contains more sand. In other areas the surface layer and subsoil contain less sand and more clay. In a few areas the surface layer is darker. In places gravel is below a depth of 40 inches.

Included with this soil in mapping are small areas of

the poorly drained Udolpho soils. These soils are lower on the landscape than the Lamont soil. They make up 3 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. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is low. The shrink-swell potential also is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, soil blowing and water erosion are hazards and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, grassed waterways, cover crops, and field windbreaks help to control erosion and soil blowing and conserve moisture. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIe.

175C2—Lamont fine sandy loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on stream terraces, outwash plains, and moraines. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable fine sandy loam about 9 inches thick. It has been thinned by erosion. The subsoil extends to a depth of about 51 inches. It is dark yellowish brown and yellowish brown, friable and very friable fine sandy loam and loamy sand. The lower part of the profile to a depth of 60 inches or more is strong brown, loose loamy sand that has bands of dark brown, very friable sandy loam. In some areas the surface layer and the upper part of the subsoil contain less sand and more clay. In other areas the surface soil is darker. In some places the subsoil has more sand. In other places gravel is below a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained, droughty Oakville soils. These soils are in landscape positions similar to those of the Lamont soil. They make up 3 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. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is low. The shrink-swell potential also is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, further soil blowing and water erosion are hazards and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, grassed waterways, cover crops, and field windbreaks help to control erosion and soil blowing and conserve moisture. A crop rotation that includes grasses and legumes helps to control soil blowing and erosion. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIe.

175D—Lamont fine sandy loam, 10 to 15 percent slopes. This strongly sloping, well drained soil is on stream terraces, outwash plains, and moraines. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable fine sandy loam about 5 inches thick. The subsurface layer is brown, very friable loamy fine sand about 5 inches thick. The subsoil extends to a depth of about 45 inches. It is dark brown, strong brown, and yellowish brown, friable and very friable fine sandy loam and loamy fine sand. The lower part of the profile to a depth of 60 inches or more is yellowish brown, loose fine sand that has bands of dark brown, very friable loamy sand. In some places the surface soil and subsoil contain less sand and more clay. In other places the subsoil is thinner and contains more sand and less clay. In a few areas the lower part of the profile is silty.

Included with this soil in mapping are small areas of the poorly drained Orio soils. These soils are in depressions below the Lamont soil and are ponded for brief periods. 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. The available water capacity is moderate. Organic matter content is low. The shrink-swell potential also is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, soil blowing and water erosion are hazards and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and soil blowing and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. A crop rotation that includes grasses and legumes helps to control erosion. Because of the limited available water capacity, irrigation may be advantageous.

Areas used for paths and trails are subject to intensive foot traffic. They should be protected against erosion by mulching.

If this soil is used as woodland, seedling mortality is a management concern. It is 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, and 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.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Land shaping and installing a sealed sand filter and a disinfection tank help to overcome these limitations.

The land capability classification is IVe.

198—Elburn silt loam. This nearly level, somewhat poorly drained soil is on outwash plains, stream terraces, and till plains. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of more than 60 inches. It is mottled. The upper part is brown and yellowish brown, friable silty clay loam. The next part is light olive brown, friable silty clay loam and silt loam. The lower part is light olive brown, loose sandy loam. In some areas the subsoil contains more sand within a depth of 40 inches. In other areas the lower part of the subsoil contains less sand.

Included with this soil in mapping are small areas of the well drained Plano and poorly drained Thorp and Drummer soils. Plano soils are slightly higher on the landscape than the Elburn soil. Thorp and Drummer soils are ponded for brief periods and are in shallow depressions below the Elburn soil. Included soils make up 2 to 12 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. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface in spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table may delay planting during some years. Subsurface drains can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation 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 curtain drains and either mounding or raising the site with suitable fill material help to overcome this limitation.

The land capability classification is I.

199A—Plano silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains, moraines, and stream terraces. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 6 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is brown, mottled silty clay loam and silt loam. The lower part is brown and dark yellowish brown, mottled, stratified silt loam, sandy loam, and loam. In some areas the lower part of the subsoil is not stratified and is silt loam. In other areas the soil is stratified within a depth of 40 inches. In some places sand is within a depth of 60 inches. In other places the lower part of the subsoil contains more gravel.

Included with this soil in mapping are small areas of the poorly drained Thorp and Drummer and somewhat poorly drained Elburn soils. Thorp soils are in depressions below the Plano soil. Drummer soils are on low flats and in drainageways below the Plano soil. Elburn soils are slightly lower on the landscape than the Plano soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Plano soil at a moderate rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

199B—Plano silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on outwash plains, moraines, and stream terraces. Individual areas are irregular in shape and range from 5 to 140 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer also is very dark grayish brown, friable silt loam. It is about 7 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. In sequence downward, it is dark brown silt loam and silty clay loam; yellowish brown silty clay loam; yellowish brown, mottled silty clay loam and clay loam; and yellowish brown, mottled, stratified clay loam and sandy loam. In some areas the surface soil is thinner. In other areas the soil is stratified within a depth of 40 inches. In places the lower part of the subsoil is not stratified and is silt loam.

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

Water and air move through the Plano soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

199B2—Plano silt loam, 2 to 5 percent slopes, eroded. This gently sloping, well drained soil is on outwash plains, moraines, and stream terraces. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 44 inches thick. It is friable. The upper part is dark yellowish brown and yellowish brown silty clay loam. The next part is yellowish brown, mottled silty clay loam and silt loam. The lower part is dark yellowish brown loam. The substratum to a depth of 60 inches or more is dark yellowish brown sandy loam. In some places the surface layer is thicker. In other places stratified loamy material is within a depth of 40 inches. In some areas the lower part of the subsoil is not stratified and is silt loam. In a few places the seasonal high water table is within a depth of 6 feet.

Included with this soil in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Elburn soils. Drummer soils are in shallow depressions and drainageways. Elburn soils are slightly lower on the landscape than the Plano soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Plano soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

199C2—Plano silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on outwash plains, moraines, and stream terraces. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 45 inches thick. It is dark yellowish brown and friable. The upper part is silty clay loam. The next part is mottled silty clay loam. The lower part is mottled clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, very friable, stratified loam, loamy sand, and sandy loam. In some areas the depth to stratified, loamy material is less than 40 inches. In other areas the lower part of the subsoil is silt loam. In some places it formed in loam till. In other places the lower part of the subsoil and the substratum are sandy.

Included with this soil in mapping are small areas of the poorly drained Drummer and moderately well drained Marseilles soils. Drummer soils are in shallow depressions and drainageways below the Plano soil. The moderately deep Marseilles soils are in landscape positions similar to those of the Plano soil. Included· soils make up 5 to 10 percent of the unit.

Water and air move through the Plano soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops and dwellings. It is well suited to hay, pasture, and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

200—Orio loam. This nearly level, poorly drained soil is in depressions between sand dunes on outwash plains. It is ponded for brief periods from March through June. Individual areas are oval or irregular in shape and range from 2 to 60 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is dark gray, mottled, friable loam about 13 inches thick. The subsoil is about 18 inches thick. It is gray and mottled. The upper part is friable clay loam. The lower part is very friable sandy loam. The substratum to a depth of 60 inches or more is grayish brown, mottled, loose sand. In some areas the surface layer and subsoil contain less sand and more clay. In other areas the surface layer is thicker. In places the subsoil contains more sand and less clay.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and somewhat poorly drained Lawler soils. Dickinson soils are in the higher, more sloping areas. Lawler soils are slightly higher on the landscape than the Orio soil. Also included are small areas of very poorly drained soils that are ponded during most of the growing season. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Orio soil at a moderately slow rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during the spring. The available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. The moderate available water capacity also is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

The land capability classification is IIw.

204C2—Ayr loamy fine sand, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on moraines. Individual areas are irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy fine sand about 9 inches thick. It has been thinned by erosion. The subsoil is about 30 inches thick. The upper part is dark yellowish brown and yellowish brown, very friable fine sand. The lower part is dark brown, friable clay loam. The substratum to a depth of 60 inches or more is brown, friable loam. In some areas the soil does not have loamy material within a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained La Rose and Parr and excessively drained Sparta soils. These soils are in landscape positions similar to those of the Ayr soil. La Rose and Parr soils contain more clay in the upper part of the subsoil than the Ayr soil. Sparta soils contain more sand in the lower part of the subsoil and in the substratum than the Ayr soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Ayr soil at a rapid rate and through the lower part at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is moderately low. Root growth is somewhat limited by massive, loamy glacial till below a depth of 39 inches. The shrink-swell potential is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, soil blowing and water erosion are hazards and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control soil blowing and erosion and conserve moisture. Winter cover crops and field windbreaks help to control soil blowing. A crop rotation that includes grasses and legumes helps to control erosion. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIs.

206—Thorp silt loam. This nearly level, poorly drained soil is in depressions on outwash plains and stream terraces. It is ponded for brief periods from February through June. Individual areas are oval or irregular in shape and range from 2 to 20 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 13 inches thick. The upper part is very dark grayish brown, and the lower part is light brownish gray. The subsoil is about 36 inches thick. It is light brownish gray, mottled, and friable. The upper part is silty clay loam. The lower part is sandy clay loam that has thin strata of loamy sand. The substratum to a depth of 60 inches or more is grayish brown, mottled, friable sandy loam. In some areas the lower part of the subsoil and the substratum contain less sand. In other areas the surface soil and subsoil contain more sand.

Included with this soil in mapping are small areas of the well drained Plano and poorly drained Harpster soils. Plano soils are slightly higher on the landscape than the Thorp soil. Harpster soils are calcareous throughout. They are in landscape positions similar to those of the Thorp soil. Included soils make up 2 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 at a moderately rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains that have surface inlets can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

210+—Lena silt loam, overwash. This nearly level, very poorly drained soil is in depressions on outwash plains and glacial moraines. It is ponded for brief periods from November through June. Individual areas are oval and range from 3 to 400 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer also is black, friable silt loam. It is about 5 inches thick. Below this to a depth of 60 inches or more is black, friable muck. This soil is calcareous throughout. In some areas the surface layer is thicker. In other areas the soil has a sandy substratum below a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Canisteo, Harpster, and Selma soils. These soils are slightly higher on the landscape than the Lena soil. They are silty or loamy to a depth of more than 60 inches. Also included are a few small areas of undrained soils that are ponded throughout most of the growing season. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Lena soil at a moderately rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 1 foot above the surface to 1 foot below during the spring. The available water capacity is high. Organic matter content is very high. The potential for frost action is high. The rate of subsidence in drained areas is about 1 foot in 10 years because of accelerated decomposition.

Most areas are cultivated. This soil is moderately suited to cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table, the ponding, and subsidence.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Surface drains can function satisfactorily if suitable outlets are available and if long sections of perforated tubing are used to prevent the damage caused by subsidence. A high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium and the effectiveness of herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. The rate of herbicide application should be adjusted to compensate for the high pH. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIIw.

221B2—Parr silt loam, 2 to 5 percent slopes, eroded. This gently sloping, well drained soil is on moraines. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 23 inches thick. It is friable. The upper part is dark brown silty clay loam. The next part is brown clay loam. The lower part is brown loam. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam. In some areas the surface layer is thicker. In other areas the substratum of calcareous loam glacial till is within a depth of 20 inches. In places the subsoil contains less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Lisbon and poorly drained Sable soils. Lisbon soils are slightly lower on the landscape than the Parr soil. Sable soils are in depressions below the Parr soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Parr soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat limited by massive, loamy glacial till below a depth of 31 inches. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome this limitation.

The land capability classification is IIe.

221C2—Parr silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on moraines. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. It is friable. The upper part is dark yellowish brown and brown clay loam. The lower part is brown, calcareous loam. The substratum to a depth of 60 inches or more is brown, friable, calcareous loam. In some areas the calcareous loam glacial till is within a depth of 20 inches. In other areas the upper part of the subsoil contains less sand. In places the surface soil is thicker.

Included with this soil in mapping are small areas of the somewhat poorly drained Lisbon and poorly drained Sable soils. Also included are a few small areas of soils that have calcareous sand or gravel in the lower part. Lisbon soils are lower on the landscape than the Parr soil. Sable soils are in depressions below the Parr soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Parr soil at a moderate rate and through the lower part at a moderately slow rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. Root growth is somewhat restricted by massive, loamy glacial till below a depth of 34 inches. The shrink-swell potential and the potential for frost action are moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome this limitation.

The land capability classification is IIIe.

223C2—Varna silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on convex slopes on moraines. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is mixed dark brown and dark yellowish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is mottled silty clay loam about 23 inches thick. The upper part is dark yellowish brown and friable. The next part is yellowish brown and firm. The lower part is light olive brown, very firm, and calcareous. The substratum to a depth of 60 inches or more is light olive brown, very firm, calcareous silty clay loam. In some areas the surface layer is lighter in color. In other areas the soil does not have calcareous silty clay loam till within a depth of 40 inches.

Included with this soil in mapping are small areas of the excessively drained Rodman soils and areas of soils that have a calcareous surface layer. Rodman soils are in landscape positions similar to those of the Varna soil. They contain more sand and gravel throughout than the Varna soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Varna soil at a moderately slow rate. In cultivated areas surface runoff is medium. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops, hay, pasture, and dwellings. It is poorly suited to septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The moderately slow permeability and the seasonal high water table are limitations on sites for septic absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIIe.

223D3—Varna silty clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on moraines. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is mixed dark brown and dark yellowish brown, friable silty clay loam about 7 inches thick. The subsoil is silty clay loam about 18 inches thick. The upper part is brown and firm. The next part is light olive brown, firm, and calcareous. The lower part is light olive brown, very firm, and calcareous. The substratum to a depth of 60 inches or more is light olive brown, mottled, very firm, calcareous silty clay loam. In some areas the surface layer is lighter in color. In other areas the soil does not have calcareous silty clay loam till within a depth of 40 inches.

Included with this soil in mapping are small areas of the excessively drained Rodman soils and small areas of soils that have a calcareous surface layer. These soils are in landscape positions similar to those of the Varna soil. Rodman soils contain more sand and gravel throughout than the Varna soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Varna soil at a moderately slow rate. In cultivated areas surface runoff is rapid. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is generally unsuited to cultivated crops because of a severe hazard of further erosion. It is poorly suited to septic tank absorption fields. It is moderately suited to hay, pasture, and dwellings.

Establishing pasture and hay crops helps to control erosion. Seedbed preparation is difficult in areas of severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to control erosion. Bromegrass, orchardgrass, timothy, and alfalfa are suitable. They should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

The shrink-swell potential and the slope are limitations on sites for dwellings without basements, and the seasonal high water table and the slope are limitations on sites for dwellings with basements. Erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Subsurface drains around basement foundations can help to remove excess water. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The moderately slow permeability, the slope, and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome the restricted permeability and the slope. Curtain drains help to remove excess water from the absorption fields.

The land capability classification is VIe.

233B—Birkbeck silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges on till plains and moraines. Individual areas are irregular in shape and range from 5 to 80 acres in size.

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

Included with this soil in mapping are small areas of

the somewhat poorly drained Stronghurst soils. These soils are lower on the landscape than the Birkbeck soil. 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. In cultivated areas surface runoff is medium. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The moderately slow permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIe.

233C2—Birkbeck silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on side slopes on till plains and moraines. Individual areas are irregular in shape and range from 3 to 60 acres in size.

Typically, the surface layer is mixed yellowish brown and dark brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is about 50 inches thick. It is friable. The upper part is yellowish brown silty clay loam. The next part is yellowish brown, mottled silty clay loam, silt loam, and loam. The lower part is yellowish brown and brown, mottled clay loam. The substratum to a depth of 60 inches or more is brown, mottled, firm, calcareous loam. In some areas the lower part of the subsoil and the substratum contain less sand. In other areas the calcareous, loamy material is within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Stronghurst soils. These soils are in the less sloping areas below the Birkbeck soil. 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. In cultivated areas surface runoff is medium. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The moderately slow permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIIe.

233D2—Birkbeck silt loam, 10 to 15 percent slopes, eroded. This strongly sloping, moderately well drained soil is on side slopes on till plains and moraines. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil extends to a depth of more than 60 inches. 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 dark yellowish brown and brown, firm clay loam. In some areas the lower part of the subsoil has less sand. In other areas the surface soil is darker. In places the surface layer is mostly subsoil material and is silty clay loam.

Included with this soil in mapping are small areas of the very steep Hennepin soils. These soils formed in calcareous, loamy glacial till downslope from the Birkbeck soil. 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. In cultivated areas surface runoff is rapid. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations and erosion is a hazard. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Subsurface drains around basement foundations can help to remove excess water. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The moderately slow permeability, the slope, and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field, land shaping, and installing the distribution lines across the slope help to overcome the restricted permeability and the slope. Curtain drains help to remove excess water from the absorption fields.

The land capability classification is IIIe.

241G—Chatsworth silt loam, 30 to 50 percent slopes. This very steep, moderately well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow and range from 3 to 400 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsoil is brown, firm, calcareous silty clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is brown, firm, calcareous silty clay loam. In some areas the calcareous silty clay loam is below a depth of 20 inches. In other areas the subsoil and substratum are loam. In places the slope is less than 30 percent.

Included with this soil in mapping are small areas of Birkbeck and Casco soils. Birkbeck soils have less sand in the upper part of the subsoil than the Chatsworth soil. They are in the less sloping areas upslope from the Chatsworth soil. Casco soils have stratified sand and gravel within a depth of 24 inches. They generally are upslope from the Chatsworth soil. Also included are seepy areas of organic soils at the contact point between layers of gravel and silty clay loam glacial till. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Chatsworth soil at a very slow rate. Surface runoff is very rapid. The available water capacity is low. Organic matter content also is low. Root growth is somewhat restricted by firm, calcareous silty clay loam till below a depth of about 15 inches.

Most areas are used for woodland wildlife habitat. This soil is well suited to woodland wildlife habitat. It is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the slope.

The development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

Areas used for paths and trails are subject to intensive foot traffic. They should be protected against erosion by mulching.

The land capability classification is VIIe.

243A—St. Charles 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 3 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of more than 60 inches. It is yellowish brown and friable. The upper part is silty clay loam. The next part is mottled silty clay loam and silt loam. The lower part is mottled, stratified loam and sandy loam. In some areas the stratified, loamy material is within a depth of 40 inches or below a depth of 60 inches. In other areas the surface soil is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Virgil soils. These soils have a dark surface layer. They are lower on the landscape than the St. Charles soil. They make up 5 to 10 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

243B—St. Charles 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 3 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 49 inches thick. It is yellowish brown and friable. The upper part is silty clay loam. The next part is mottled silt loam. The lower part is stratified loam, sandy loam, and silt loam. The substratum to a depth of 60 inches or more is yellowish brown, friable, stratified loam and silt loam. In some areas the stratified, loamy material is within a depth of 40 inches or below a depth of 60 inches. In places the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Virgil soils. These soils have a dark surface layer. They are lower on the landscape than the St. Charles soil. They make up 5 to 10 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

243C2—St. Charles silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil extends to a depth of more than 60 inches. In sequence downward, it is dark yellowish brown and yellowish brown silty clay loam; yellowish brown, mottled silty clay loam; yellowish brown, mottled loam; and yellowish brown, mottled loam that has strata of sandy loam. In some areas the stratified, loamy material is within a depth of 40 inches or below a depth of 60 inches. In other areas the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Virgil soils. These soils are lower on the landscape than the St. Charles soil. They make up 5 to 10 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops, woodland, and dwellings. It is well suited to hay, pasture, and septic absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

244—Hartsburg silty clay loam. This nearly level, poorly drained soil is on broad flats and in shallow depressions on till plains and lake plains. It is ponded 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 8 inches thick. The subsurface layer is silty clay loam about 11 inches thick. The upper part is black and firm. The lower part is very dark gray and friable. The subsoil is about 21 inches thick. It is mottled, friable, and calcareous. The upper part is dark gray silty clay loam. The next part is olive gray silty clay loam. The lower part is olive gray silt loam. The substratum to a depth of 60 inches or more is light olive gray, mottled, friable, calcareous silt loam. In some areas the lower part of the subsoil and the substratum are stratified within a depth of 40 inches and contain more sand. In other areas the calcareous material is below a depth of 40 inches. In some places the surface soil is thicker and is silt loam in the upper part. In other places the soil is calcareous throughout.

Included with this soil in mapping are small areas of undrained soils that are ponded during the growing season. These soils make up 3 to 8 percent of the unit.

Water and air move through the Hartsburg soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

This soil is cultivated. It is well suited to cultivated crops. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

259D3—Assumption silty clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow and range from 3 to 30 acres in size.

Typically, the surface layer is mixed dark yellowish brown and very dark gray, friable silty clay loam about 8 inches thick. The subsoil is about 21 inches thick. It is dark yellowish brown and yellowish brown, friable silty clay loam and silt loam. The substratum is dark brown and light brownish gray, mottled, friable, calcareous silt loam. It extends to a buried soil at a depth of about 36 inches. The buried soil is dark grayish brown, mottled, firm silty clay loam. In some areas the subsoil is thicker and contains more clay. In other areas the surface layer is lighter in color.

Included with this soil in mapping are small areas of the well drained Hickory and Marseilles soils. Also included are somewhat poorly drained, slowly permeable soils in landscape positions similar to those of the Assumption soil. Hickory and Marseilles soils are on side slopes below the Assumption soil. Marseilles soils formed in 20 to 40 inches of silty material and are underlain by weathered shale. Hickory soils contain more sand in the upper part than the Assumption soil. Included soils make up about 10 percent of the unit.

Water and air move through the upper part of the Assumption soil at a moderate rate and through the lower part at a moderately slow or slow rate. Surface runoff is rapid. The seasonal high water table is 2.5 to 4.5 feet below the surface in spring. The available water capacity is high. Organic matter content is low. The shrink swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings without basements, the shrink-swell potential and the slope are limitations and erosion is a hazard. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Subsurface drains around basement foundations can help to remove excess water. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The slow or moderately slow permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IVe.

272—Edgington silt loam. This nearly level, poorly drained soil is in depressions in the uplands. It is ponded for brief periods from March through June. Individual areas are round or irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is friable and very friable silt loam about 19 inches thick. The upper part is black. The lower part is gray and dark gray and is mottled. The subsoil is mottled, friable silty clay loam about 28 inches thick. The upper part is light brownish gray, and the lower part is light gray. The substratum to a depth of 60 inches or more is light gray, mottled, massive silt loam. In some areas, the surface soil is thinner and the subsoil contains more clay. In other areas the soil does not have a gray subsurface layer. In places the substratum is stratified and contains more sand.

Included with this soil in mapping are small areas of soils that are ponded throughout most of the growing season. Also included are small areas of the somewhat poorly drained Atterberry and Muscatine soils on the slightly higher parts of the landscape. Included soils make up 3 to 10 percent of the unit.

Water and air move through the Edgington soil at a moderately slow rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains that have surface inlets may be needed and can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

277B—Port Byron silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on loess-covered till plains and moraines. Individual areas are irregular in shape and range from 3 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 5 inches thick. The subsoil to a depth of more than 60 inches is friable silt loam. The upper part is dark brown. The next part is yellowish brown. The lower part is yellowish brown and mottled. In some areas the subsoil contains more clay. In other areas the lower part of the subsoil is stratified and contains more sand. In some places the surface layer is thinner. In other places the seasonal high water table is within a depth of 4 feet during the spring.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and well drained Oakville and Waukegan soils. These soils are more droughty than the Port Byron soil. Dickinson and Waukegan soils are in landscape positions similar to those of the Port Byron soil. Oakville soils are upslope from the Port Byron soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Port Byron soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The seasonal high water table is a limitation on sites for dwellings with basements and for septic tank absorption fields. Subsurface drains around basement foundations can help to remove excess water on building sites. Curtain drains can help to remove excess water from septic tank absorption fields.

The land capability classification is IIe.

277B2—Port Byron silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on loess-covered till plains and moraines. Individual areas are irregular in shape and range from 3 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil to a depth of more than 60 inches is friable silt loam. The upper part is dark yellowish brown. The lower part is yellowish brown and mottled. In some areas the surface soil is thicker. In other areas the subsoil contains more clay. In some places the lower part of the subsoil is stratified and contains more sand. In other places the seasonal high water table is within a depth of 4 feet during the spring.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and well drained Oakville and Waukegan soils. These soils are more droughty than the Port Byron soil. Dickinson and Waukegan soils are in landscape positions similar to those of the Port Byron soil. Oakville soils are upslope from the Port Byron soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Port Byron soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The seasonal high water table is a limitation on sites for dwellings with basements and for septic tank absorption fields. Subsurface drains around basement foundations can help to remove excess water on building sites. Curtain drains can help to remove excess water from absorption fields.

The land capability classification is IIe.

277C2—Port Byron silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on loess-covered till plains and moraines. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is friable silt loam about 46 inches thick. The upper part is yellowish brown. The lower part is yellowish brown and mottled. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the surface soil is lighter in color. In other areas the lower part of the subsoil is stratified and contains more sand. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and well drained Oakville and Waukegan soils. These soils are more droughty than the Port Byron soil. Dickinson and Waukegan soils are in landscape positions similar to those of the Port Byron soil. Oakville soils are upslope from the Port Byron soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Port Byron soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The seasonal high water table is a limitation on sites for dwellings with basements and for septic tank absorption fields. Subsurface drains around basement foundations can help to remove excess water on building sites. Curtain drains can help to remove excess water from septic tank absorption fields.

The land capability classification is IIIe.

278—Stronghurst silt loam. This nearly level, somewhat poorly drained soil is on uplands. Individual areas are irregular in shape and range from 3 to 70 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is yellowish brown, mottled, friable and firm silty clay loam about 34 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the surface layer is darker. In other areas the substratum is calcareous silt loam.

Included with this soil in mapping are small areas of the moderately well drained Downs and Rozetta, poorly drained Edgington, and well drained Fayette soils. Downs, Fayette, and Rozetta soils are higher on the landscape than the Stronghurst soil. Edgington soils are in depressions below the Stronghurst soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Stronghurst soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table can delay planting in some years. Subsurface drains can function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

In wooded areas of this soil, excluding livestock from the woodland prevents 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 seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability and the seasonal high water table are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness.

The land capability classification is IIw.

279A—Rozetta silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on uplands. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of more than 60 inches. It is yellowish brown and friable. The upper part is silt loam and silty clay loam. The next part is mottled silty clay loam. The lower part is mottled silt loam. In some areas the surface layer is darker. In other areas the lower part of the soil is stratified and contains more sand. In some places it is calcareous loam till. In other places the seasonal high water table is below a depth of 6 feet.

Included with this soil in mapping are small areas of the somewhat poorly drained Atterberry and Stronghurst soils. These soils are lower on the landscape than the Rozetta soil. They make up 5 to 10 percent of the unit.

Water and air move through the Rozetta soil at a moderate rate. In cultivated areas surface runoff is slow. The available water capacity is high. The seasonal high water table is 4 to 6 feet below the surface during the spring. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer minimize crusting and help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is I.

279B—Rozetta 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 3 to 300 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of more than 60 inches. It is friable. The upper part is dark yellowish brown silt loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silty clay loam. In some areas the lower part of the subsoil is stratified and contains more sand. In other areas calcareous loam glacial till is within a depth of 60 inches. In other places the seasonal high water table is below a depth of 6 feet. In places the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Atterberry and Stronghurst soils. These soils are slightly lower on the landscape than the Rozetta soil. They make up 2 to 10 percent of the unit.

Water and air move through the Rozetta soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIe.

280B—Fayette 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 3 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of more than 60 inches. It is yellowish brown and friable. The upper part is silty clay loam. The next part is mottled silty clay loam. The lower part is mottled silt loam. In some areas the surface layer is darker. In other areas the lower part of the subsoil is stratified and contains more sand. In some places calcareous, loamy till is within a depth of 50 inches. In other places the seasonal high water table is within a depth of 6 feet.

Included with this soil in mapping are small areas of the somewhat poorly drained Atterberry and Stronghurst soils. These soils are lower on the landscape than the Fayette soil. They make up 5 to 10 percent of the unit.

Water and air move through the Fayette soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

280C2—Fayette silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is mixed dark yellowish brown and dark brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil extends to a depth of more than 60 inches. It is yellowish brown and friable. The upper part is silty clay loam. The next part is mottled silty clay loam. The lower part is mottled silt loam. In some areas the seasonal high water table is within a depth of 6 feet during the spring. In other areas the surface layer is darker. In some places it is thicker. In other places the lower part of the subsoil is stratified and contains more sand. In some areas calcareous silt loam is within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are in drainageways below the Fayette soil. Also included are a few small areas of soils that are calcareous at the surface. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Fayette soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

280C3—Fayette silty clay loam, 5 to 10 percent slopes, severely eroded. This sloping, well drained soil is on side slopes in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable silty clay loam about 8 inches thick. The subsoil is about 40 inches thick. It is yellowish brown and friable. The upper part is silty clay loam. The lower part is mottled silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable, calcareous silt loam. In some areas the lower part of the subsoil and the substratum are stratified and contain more sand. In other areas the calcareous silt loam is within a depth of 40 inches. In places the seasonal high water table is within a depth of 6 feet.

Included with this soil in mapping are small areas of soils that are gravelly or calcareous at the surface and areas of the somewhat poorly drained Radford soils. Radford soils are in drainageways below the Fayette soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Fayette soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that is dominated by grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IVe.

280D2—Fayette silt loam, 10 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 3 to 50 acres in size.

Typically, the surface layer is mixed dark brown and yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 39 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of 60 inches or more is yellowish brown, friable, calcareous silt loam. In some areas the lower part of the subsoil and the substratum are stratified and contain more sand. In other areas the substratum is calcareous silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are in drainageways below the Fayette soil. Also included are a few small areas of soils that are calcareous at the surface. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Fayette soil at a moderate rate. In cultivated areas surface runoff is rapid. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops, hay, pasture, woodland, septic tank absorption fields, and dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 and the slope are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established helps to control erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The land capability classification is IIIe.

282D3—Chute fine sand, 7 to 20 percent slopes, severely eroded. This strongly sloping, excessively drained soil is on dunes on outwash plains. In most areas, nearly all of the original surface layer has been removed by soil blowing and water erosion. Individual areas are irregular in shape and range from 3 to 150 acres in size.

Typically, the surface layer is brown, very friable calcareous fine sand about 4 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown, loose, calcareous fine sand. In some areas the surface layer is darker. In other areas the soil is not so severely eroded. In some places a dark buried soil is within a depth of 40 inches. In other places the substratum contains more clay and less sand. In some areas the slope is less than 7 percent.

Included with this soil in mapping are small areas of the poorly drained Orio and well drained Tell and Waukegan soils. Orio soils are in depressions below the Chute soil. Tell and Waukegan soils are silt loam in the upper part. Tell soils are in landscape positions similar to those of the Chute soil. Waukegan soils are commonly downslope from the Chute soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Chute soil at a rapid rate. Surface runoff is medium. The available water capacity and organic matter content are low. The shrink-swell potential and the potential for frost action also are low.

Most areas are used as pasture or woodland wildlife habitat. This soil is poorly suited to pasture, woodland wildlife habitat, hay, woodland, and septic tank absorption fields. It generally is unsuited to cultivated crops because of the erosion hazard and the low available water capacity. It is moderately suited to dwellings. It is a probable source of sand.

In the areas used for hay and pasture, further soil blowing and water erosion are hazards and the low available water capacity is a limitation, particularly during establishment. Seeding of the pasture or hayland, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control soil blowing and water erosion. Planting drought-resistant species of grasses and legumes helps to establish a plant cover. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of 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, and 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. Establishing wildlife food plots and additional cover is difficult because of the low available water capacity and low fertility. Drought-resistant plant species can be used for wildlife cover. Measures that protect the habitat from fire and from grazing by livestock are essential.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazards of erosion and soil blowing.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Land shaping and installing a sealed sand filter and a disinfection tank help to overcome these limitations.

The land capability classification is VIIs.

290A—Warsaw loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains, stream terraces, and moraines. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer is dark brown, friable loam about 4 inches thick. The subsoil is about 21 inches thick. It is brown and friable. The upper part is loam. The lower part is gravelly clay loam. The substratum to a depth of 60 inches or more is yellowish brown, loose, calcareous very gravelly sand. In some areas, the subsoil contains less sand and calcareous gravelly sand is below a depth of 40 inches. In other areas the substratum contains less gravel and more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Kane soils. These soils are lower on the landscape than the Warsaw soil. They make up 2 to 5 percent of the unit.

Water and air move through the upper part of the Warsaw soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is slow. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

290B—Warsaw loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on outwash plains, stream terraces, and moraines. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer also is very dark brown, friable loam. It is about 5 inches thick. The subsoil is about 18 inches thick. The upper part is dark yellowish brown, friable loam. The next part is dark brown, friable loam. The lower part is brown, very friable gravelly sandy loam. The substratum to a depth of 60 inches or more is dark yellowish brown, loose, calcareous very gravelly sand. In some areas the soil does not have calcareous sand and gravel within a depth of 40 inches. In other areas the surface layer and the upper part of the subsoil contain less sand. In places the lower part of the subsoil and the substratum are loam or sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and Kane and excessively drained Hononegah and Rodman soils. Elburn and Kane soils are lower on the landscape than the Warsaw soil. Hononegah and Rodman soils have less clay and silt in the upper part than the Warsaw soil. They are in landscape positions similar to those of the Warsaw soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Warsaw soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIe.

290B2—Warsaw silt loam, 2 to 5 percent slopes, eroded. This gently sloping, well drained soil is on stream terraces, outwash plains, and moraines. Individual areas are irregular in shape and range from 5 to 45 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. It is friable. The upper part is dark yellowish brown clay loam and loam. The next part is brown sandy loam. The lower part is brown gravelly sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose, calcareous very gravelly sand. In some areas the surface layer is thicker. In other areas the depth to calcareous very gravelly sand is more than 40 inches. In some places the substratum contains less gravel. In other places it is calcareous loam.

Included with this soil in mapping are small areas of the excessively drained Hononegah and Rodman soils. These soils are in landscape positions similar to those of the Warsaw soil. Hononegah soils contain more sand and less gravel in the upper part of the subsoil than the Warsaw soil. Rodman soils contain more gravel throughout the upper part than the Warsaw soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Warsaw soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIe.

290C2—Warsaw silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes along drainageways on stream terraces, outwash plains, and moraines. Individual areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 17 inches thick. It is dark yellowish brown. The upper part is friable loam. The lower part is very friable gravelly sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose, calcareous very gravelly sand. In some areas the substratum is loamy sand or sand. In other areas the soil does not have calcareous very gravelly sand within a depth of 40 inches. In places the substratum is calcareous loam.

Included with this soil in mapping are small areas of the excessively drained Hononegah and Rodman soils. Hononegah soils contain more sand and less gravel in the upper part of the subsoil than the Warsaw soil. They are in landscape positions similar to those of the Warsaw soil. Rodman soils contain more gravel and less clay in the subsoil than the Warsaw soil. They are on side slopes below the Warsaw soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Warsaw soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is moderate.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIe.

292—Wallkill silty clay loam. This nearly level, very poorly drained soil is in depressions on moraines. It is ponded for brief periods from September through June. Individual areas are round or irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsoil is about 26 inches thick. It is black and friable. The upper part is silty clay loam. The lower part is mucky silt loam. The substratum to a depth of 60 inches or more is black, friable muck. In some areas the soil is mineral throughout and contains more sand.

Included with this soil in mapping are small areas of the very poorly drained Aurelius and Edwards soils. These soils have organic layers in the upper part. Also included are soils that have a calcareous surface layer and soils that are ponded throughout most of the growing season. Included soils are in landscape positions similar to those of the Wallkill soil or are in the lower positions. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Wallkill soil at a moderate rate and through the lower part at a moderately rapid or rapid rate. In cultivated areas surface runoff is very slow or ponded. The seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during winter and spring. The available water capacity is very high. Organic matter content is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops and woodland. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Surface drains can function satisfactorily if suitable outlets are available. If drained, the soil is subject to subsidence. Installing subsurface drains with long sections of perforated tubing helps to prevent the damage caused by subsidence. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

In areas used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns because of the seasonal high water table. Plant competition also is a management concern. The use of equipment is limited to periods when the soil is firm. Planting mature nursery stock on prepared ridges reduces the seedling mortality rate. A harvesting method that does not isolate the remaining trees or leave them widely spaced reduces the hazard of windthrow. Removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland also reduces this hazard. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 land capability classification is IIIw.

312—Edwards muck. This nearly level, very poorly drained soil is in depressions on outwash plains and moraines. It is ponded for brief periods from September through June. Individual areas are irregular in shape and range from 5 to 1,000 acres in size.

Typically, the surface layer is black, friable muck about 8 inches thick. The subsurface layer also is black, friable muck. It is about 12 inches thick. The upper part of the substratum is very dark grayish brown, mottled, friable organic material. The next part is light brownish gray and grayish brown, mottled, friable marl. The lower part to a depth of 60 inches or more is stratified olive gray and grayish brown, mottled organic material and marl. In some areas the surface layer is silt loam. In other areas the muck is less than 16 inches thick and is underlain by mineral material. In places it is underlain by more than 16 inches of mineral material. In a few areas the substratum is sandy.

Water and air move through the upper part of this soil at a moderate or moderately rapid rate. Permeability varies in the substratum. In cultivated areas runoff is very slow or ponded. The seasonal high water table is 1 foot above the surface to 1 foot below during winter and spring. The available water capacity is high. Organic matter content is very high. The potential for frost action is high. The rate of subsidence in drained areas is about 1 foot in 10 years because of accelerated decomposition.

Most areas are cultivated. This soil is poorly suited to cultivated crops, hay, pasture, and woodland. It generally is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Soil blowing is a hazard. Measures that maintain or improve the drainage system may be needed. Surface drains can function satisfactorily if suitable outlets are available. The soil is subject to subsidence. Installing subsurface drains with long sections of perforated tubing can help to prevent the damage caused by subsidence. A conservation tillage system that leaves crop residue on the surface after planting, cover crops, and field windbreaks help to control soil blowing.

In areas used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns because of the seasonal high water table. Plant competition also is a management concern. The use of equipment is limited to periods when the soil is firm. Planting mature nursery stock on prepared ridges reduces the seedling mortality rate. A harvesting method that does not isolate the remaining trees or leave them widely spaced reduces the hazard of windthrow. Removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland also reduces this hazard. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 land capability classification is IVw.

343—Kane loam. This nearly level, somewhat poorly drained soil is on outwash plains and stream terraces. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer also is black, friable loam. It is about 3 inches thick. The subsoil is about 15 inches thick. It is mottled and friable. The upper part is dark grayish brown clay loam. The lower part is dark brown sandy clay loam. The upper part of the substratum is yellowish brown, mottled, loose gravelly loamy sand. The lower part to a depth of 60 inches or more is dark brown, calcareous, loose very gravelly sand. In some areas the soil contains less sand and gravel throughout. In other areas the substratum contains less gravel. In places, the subsoil contains less sand and the gravelly material is below a depth of 40 inches.

Included with this soil in mapping are small areas of the very poorly drained Aurelius, excessively drained Rodman, and well drained Warsaw soils. Aurelius soils are in depressions below the Kane soil. Rodman and Warsaw soils are in the more sloping areas. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Kane soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation. The seasonal high water table can delay planting in some years. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture and maintain tilth and fertility. Because of the moderate available water capacity, irrigation may be advantageous. Subsurface drains can function satisfactorily if suitable outlets are available. Enclosing the drains with filtering material can keep sand from clogging tile lines.

The seasonal high water table and the shrink-swell potential are limitations on sites for dwellings. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table and a poor filtering capacity are limitations on sites for septic tank absorption fields. Curtain drains can remove excess water from the absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

347—Canisteo silt loam. This nearly level, poorly drained soil is in depressions on moraines. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is black, friable, calcareous silt loam about 10 inches thick. The subsoil is friable, calcareous loam about 17 inches thick. The upper part is dark grayish brown and mottled. The lower part is mottled light brownish gray and strong brown. The substratum to a depth of 60 inches or more is firm, calcareous loam. The upper part is mottled brown and strong brown. The lower part is brown and mottled. In some areas the substratum is sandy. In other areas the surface layer and subsoil are not calcareous. In places the surface layer is thinner. In a few areas the soil is gently sloping.

Included with this soil in mapping are small areas of soils that have a surface layer of muck. Also included are soils that are gravelly throughout. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Canisteo soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content also is high. Root growth is somewhat limited by massive, loamy glacial till below a depth of 27 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. A high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium and the effectiveness of herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. Adjusting the rate of herbicide application can help to compensate for the high pH. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

354C2—Hononegah sandy loam, 5 to 10 percent slopes, eroded. This sloping, excessively drained soil is on stream terraces and outwash plains. Individual areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is very dark grayish brown, friable sandy loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 24 inches thick. The upper part is dark yellowish brown, very friable sand and loamy sand. The lower part is dark brown, very friable loamy sand and friable sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose, calcareous very gravelly sand. In some areas the substratum contains less gravel. In other areas the soil has more gravel throughout.

Included with this soil in mapping are small areas of the well drained Warsaw and Waukegan soils. These soils contain more clay in the surface layer and subsoil than the Hononegah soil. They are on side slopes below the Hononegah soil. They make up 5 to 15 percent of the unit.

Water and air move through the Hononegah soil at a very rapid rate. In cultivated areas surface runoff is slow. The available water capacity is very low. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are low.

Most areas are cultivated. This soil is unsuited to cultivated crops because of the very low available water capacity. It is poorly suited to hay, pasture, and septic tank absorption fields. It is well suited to dwellings.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is VIs.

369A—Waupecan 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 100 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is dark brown, friable silt loam. The next part is yellowish brown, friable silty clay loam, silt loam, and sandy loam. The lower part is yellowish brown and strong brown, very friable loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose, calcareous very gravelly sand. In some areas the substratum contains less gravel. In other areas the upper part of the soil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer, somewhat poorly drained Elburn, and well drained Waukegan and Warsaw soils. Drummer and Elburn soils are lower on the landscape than the Waupecan soil. Also, they contain less gravel in the substratum. Waukegan and Warsaw soils are in landscape positions similar to those of the Waupecan soil and are in the more sloping areas. Waukegan soils have sandy material within a depth of 40 inches, and Warsaw soils have gravelly material within a depth of 40 inches. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Waupecan soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

369B—Waupecan 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 50 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 11 inches thick. The subsoil is about 32 inches thick. It is friable. The upper part is dark yellowish brown silt loam and yellowish brown silty clay loam. The next part is yellowish brown silt loam. The lower part is yellowish brown gravelly loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose very gravelly sand. In some areas the surface layer is thinner. In other areas the content of gravel is lower in the lower part of the subsoil and in the substratum. In places the upper part of the soil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and well drained Warsaw and Waukegan soils. Elburn soils are lower on the landscape than the Waupecan soil. Also, they contain less gravel in the lower part. Warsaw and Waukegan soils are in landscape positions similar to those of the Waupecan soil. Waukegan soils have sandy material within a depth of 40 inches, and Warsaw soils have gravelly material within a depth of 40 inches. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Waupecan soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

369B2—Waupecan silt loam, 2 to 5 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 3 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 32 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is dark yellowish brown, mottled silty clay loam. The lower part is brown sandy loam. The substratum to a depth of 60 inches or more is dark brown, loose, calcareous gravelly sand. In some areas the surface layer is thicker. In other areas the substratum contains less gravel. In places the upper part of the soil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Elburn and well drained Waukegan and Warsaw soils. Elburn soils are lower on the landscape than the Waupecan soil. Also, they contain less gravel in the lower part. Waukegan and Warsaw soils are in landscape positions similar to those of the Waupecan soil or are in the more sloping areas. Waukegan soils have a sandy substratum within a depth of 40 inches. Warsaw soils have a gravelly substratum within a depth of 40 inches. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Waupecan soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is medium. The available water capacity and organic matter content are moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and septic tank absorption fields. It is moderately suited to dwellings.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

386A—Downs silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is mainly on the tops of ridges in the uplands. In a few areas it is on stream terraces. 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 9 inches thick. The subsoil is about 44 inches thick. It is friable. The upper part is brown and dark yellowish brown silt loam and silty clay loam. The next part is yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled, friable silt loam. In some areas the surface layer is thinner and light in color. In other areas it is thicker. In some places depth to the seasonal high water table is less than 4 feet during the spring. In other places the slope is more than 2 percent.

Included with this soil in mapping are small areas of the poorly drained Edgington soils. These soils have more clay in the subsoil than the Downs soil. They are in depressions below the Downs soil. They make up 5 to 10 percent of the unit.

Water and air move through the Downs soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is I.

386B—Downs silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops and the upper 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 mixed very dark grayish brown and dark brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is friable. The upper part is dark brown silt loam and dark yellowish brown silty clay loam. The next part is dark yellowish brown and yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the surface layer is thicker. In other areas it is lighter in color. In a few places depth to the seasonal high water table is less than 4 feet in spring.

Included with this soil in mapping are small areas of the poorly drained Edgington soils. These soils are in depressions below the Downs soil. They make up 2 to 5 percent of the unit.

Water and air move through the Downs soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIe.

386C2—Downs silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is mixed very dark grayish brown and brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is about 48 inches thick. It is friable. The upper part is brown and dark yellowish brown silt loam and silty clay loam. The next part is yellowish brown silty clay loam. The lower part is yellowish brown, mottled silt loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable silt loam. In some areas the surface layer is lighter in color or is thinner. In other areas, the subsoil is thinner and free lime is within a depth of 20 inches. In places firm, loamy glacial till is within a depth of 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are in drainageways below the Downs soil. They make up 2 to 10 percent of the unit.

Water and air move through the Downs soil at a moderate rate. In cultivated areas surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops and woodland. It is well suited to pasture and hay. It is moderately suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The seasonal high water table is a limitation on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields.

The land capability classification is IIIe.

440A—Jasper silt loam, 0 to 2 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 75 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer also is very dark gray, friable silt loam. It is about 10 inches thick. The subsoil is about 26 inches thick. It is friable. The upper part is brown silt loam. The next part is brown loam. The lower part is dark yellowish brown sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, friable, calcareous, stratified loam and silt loam. In some areas the lower part of the subsoil and the substratum are loamy sand or sand. In other areas the substratum contains gravel. In places the surface soil and subsoil contain less sand.

Included with this soil in mapping are small areas of the excessively drained Dickinson and Rodman, somewhat poorly drained La Hogue, and well drained Ross soils. Dickinson soils are on narrow dunes above the Jasper soil. Rodman soils are on terrace breaks below the Jasper soil. La Hogue soils are slightly lower on the landscape than the Jasper soil. Ross soils are on flood plains below the Jasper soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Jasper soil at a moderate rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is I.

440B—Jasper 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 3 to 60 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark gray and very dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam. The next part is dark yellowish brown clay loam. The lower part is yellowish brown loam. The substratum to a depth of 60 inches or more is yellowish brown, friable, calcareous silt loam. In some areas the lower part of the subsoil and the substratum contain more sand. In other areas the substratum contains gravel. In places the surface layer and subsoil contain less sand.

Included with this soil in mapping are small areas of the excessively drained Dickinson and Rodman, well drained Ross, and somewhat poorly drained La Hogue soils. Dickinson soils are on narrow dunes above the Jasper soil. Rodman soils are on terrace breaks below the Jasper soil. La Hogue soils are slightly lower on the landscape than the Jasper soil. Ross soils are on flood plains below the Jasper soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Jasper soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

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 300 acres in size.

Typically, the surface layer is black, friable, calcareous loam about 7 inches thick. The subsurface layer also is black, friable, calcareous loam. It is about 10 inches thick. The subsoil is about 27 inches thick. It is mottled, friable, and calcareous. The upper part is very dark grayish brown and dark grayish brown loam. The next part is olive gray loam. The lower part is dark grayish brown sandy loam. The substratum to a depth of 60 inches or more is very dark gray and grayish brown, mottled, loose, calcareous sand. In some areas the soil contains less sand throughout. In other areas the sandy substratum is within a depth of 40 inches. In places the soil is deeper to calcareous material.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and very poorly drained Aurelius soils. Dickinson soils are in higher, more sloping areas. They are droughty and do not have carbonates throughout. Aurelius soils are mucky. They are in depressions below the Canisteo soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Canisteo soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table is within a depth of 1 foot during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the seasonal high water table.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. A high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium and the effectiveness of herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. Adjusting the herbicide application rate can help to compensate for the high pH. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

451—Lawson silt loam. This nearly level, somewhat poorly drained soil is on flood plains. It is occasionally flooded for brief periods from March through June. Individual areas are long and narrow and range from 5 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsurface layer is friable silt loam about 17 inches thick. The upper part is black, and the lower part is very dark grayish brown. The substratum to a depth of more than 60 inches is mottled, friable silt loam. The upper part is dark grayish brown. The lower part is grayish brown. In some areas the soil is stratified throughout and contains more sand. In other areas the seasonal high water table is below a depth of 3 feet. In places a buried soil is within a depth of 40 inches.

Included with this soil in mapping are small areas of soils that are calcareous at the surface and soils that have sand and gravel within a depth of 40 inches. Included soils are in landscape positions similar to those of the Lawson soil. They make up 2 to 5 percent of the unit.

Water and air move through the Lawson soil at a moderate rate. In cultivated areas surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is very high. Organic matter content is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table can delay planting during some years. Flooding occurs less often than once in 2 years, but it can delay planting in some years. Additional drainage measures may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

479—Aurelius muck, sandy substratum. This nearly level, very poorly drained soil is on lake plains and outwash plains. It is frequently ponded for long periods from November through June. Individual areas are irregular in shape and range from 3 to 500 acres in size.

Typically, the surface layer is black, friable muck about 10 inches thick. The upper part of the substratum is gray, light brownish gray, and yellowish brown, mottled, friable marl. The lower part to a depth of 60 inches or more is dark gray loamy sand. In some areas the surface layer is thicker. In other areas the soil is mineral throughout.

Included with this soil in mapping are small areas of undrained soils that are ponded throughout most of the growing season. Also included are soils that have sand and gravel within a depth of 40 inches. Included soils are in landscape positions similar to those of the Aurelius soil. They make up 2 to 5 percent of the unit.

Permeability varies in the layers of marl in the Aurelius soil and is rapid in the sandy part of the substratum. In cultivated areas runoff is very slow or ponded. The seasonal high water table ranges from 1 foot above the surface to 1 foot below during the winter and spring. The available water capacity is very high. Organic matter content also is very high. The potential for frost action is high. The rate of subsidence in drained areas is about 2 inches in 10 years because of accelerated decomposition of organic matter.

Most areas are cultivated. This soil is moderately suited to cultivated crops. It generally is unsuitable as a site for septic tank absorption fields and dwellings because of the ponding and low strength.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Soil blowing is a hazard. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. A system of conservation tillage that leaves crop residue on the surface after planting, cover crops, and field windbreaks help to control soil blowing.

The land capability classification is IIIw.

536—Dumps, mine. This map unit consists of nearly level to very steep accumulations of refuse derived from the washing and separation of coal. Individual areas are irregular in shape or fan shaped and range from 7 to 160 acres in size.

The material consists of shale and siltstone fragments, sandstone cobbles, coal fragments, and loamy material from the cast overburden. It is clay loam, silty clay loam, silt loam, and the shaly analogs of those textures. The material is dominantly red and gray. The entire unit and the included areas of water are very strongly acid or extremely acid.

Included in this unit in mapping are dumps containing gypsum produced by fertilizer processing plants. Also included are escarpments near areas of water and near the edge of the mapped areas, where the unit is adjacent to natural soils. Included areas make up less than 20 percent of the unit.

Surface runoff is ponded or is slow to very rapid. The runoff is toxic to most plants because of extreme acidity. The material is compact and is easily eroded. The nearly level areas are wet. Depth to the water table has not been ascertained. The material has practically no organic matter.

All of the acreage is idle land. This unit supports virtually no vegetation, except for cottonwood, bristly locust, and boxelder, which grow almost exclusively in small areas where the material is reddish. The gray material is more acid than the reddish material.

Some areas of this unit have potential for recreational uses, such as shooting ranges, paths and trails, and other low-intensity uses. The major problems are wetness in the nearly level areas and erosion and toxic runoff in the more sloping areas. The toxic runoff can be kept from entering drainageways and areas of deep water and from running onto cropland by the construction of holding ponds. Reclamation would involve grading, shaping, and covering the areas with enough natural soil material to support vegetation. The feasibility and extent of reclamation depend on the conditions determined by onsite investigation and on the particular use intended.

This map unit is not assigned a land capability classification.

548B2—Marseilles silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 120 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is silty clay loam about 25 inches thick. The upper part is brown and yellowish brown and is friable. The lower part is brown, mottled, and firm. Light yellowish brown, mottled, very firm, soft shale bedrock is at a depth of about 34 inches. In some areas the weathered shale is within a depth of 20 inches. In other areas layers of sand are above the shale. In places the slope is more than 5 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and poorly drained Drummer soils. Dickinson soils contain more sand throughout than the Marseilles soil. They are in landscape positions similar to those of the Marseilles soil. Drummer soils are in drainageways below the Marseilles soil. Included soils make up as much as 2 to 5 percent of the unit.

Water and air move through the upper part of the Marseilles soil at a moderate rate and through the lower part at a slow rate. In cultivated areas surface runoff is medium. The seasonal high water table is 1.5 to 3.5 feet below the surface during the spring. The available water capacity is moderate. The organic matter content is moderately low. Root growth is somewhat limited by the weathered shale bedrock at a depth of about 34 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings. The seasonal high water table also is a limitation on sites for dwellings with basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains around basement foundations can help to remove excess water.

The slow permeability, the seasonal high water table, and the depth to bedrock are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness and the depth to bedrock.

The land capability classification is IIe.

548C2—Marseilles silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark brown, friable silt loam about 7 inches thick. It has been thinned by erosion. The subsoil is about 33 inches thick. In sequence downward, it is dark brown and dark yellowish brown, friable silt loam and silty clay loam; yellowish brown, friable silty clay loam; and olive, mottled, friable silty clay. Olive, mottled, very firm, soft shale bedrock is at a depth of about 40 inches. In some areas the weathered shale bedrock is within a depth of 20 inches. In other areas sandy layers are above the shale. In places the upper part of the subsoil is mottled.

Included with this soil in mapping are small areas of the somewhat excessively drained Dickinson and somewhat poorly drained Elburn soils. Dickinson soils contain more sand in the subsoil and substratum than the Marseilles soil. They are in landscape positions similar to those of the Marseilles soil. Elburn soils are in nearly level areas below the Marseilles soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Marseilles soil at a moderate rate and through the lower part at a slow rate. In cultivated areas surface runoff is medium. The seasonal high water table is 1.5 to 3.5 feet below the surface during the spring. The available water capacity is moderate. Organic matter content is moderately low. Root growth is somewhat limited by the weathered shale bedrock at a depth of about 40 inches. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential, the slope, and the seasonal high water table are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Subsurface drains around basement foundations can help to remove excess water. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The slow permeability, the seasonal high water table, and the depth to bedrock are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome the restricted permeability. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness and the depth to bedrock.

The land capability classification is IIIe.

549G—Marseilles silt loam, 30 to 60 percent slopes. This very steep, 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 very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is silty clay loam about 27 inches thick. The upper part is yellowish brown and brown and is friable. The lower part is grayish brown and olive gray, mottled, and firm. Olive gray and olive, mottled, firm and very firm, soft shale bedrock is at a depth of about 36 inches. In some places the shale is calcareous. In other places it is within a depth of 20 inches. In some areas the soil does not have bedrock within a depth of 60 inches.

Included with this soil in mapping are small areas of Hennepin soils. These soils formed in loamy glacial till. They are in landscape positions similar to those of the Marseilles soil. Also included are areas of shale outcrops. Included areas make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Marseilles soil at a moderate rate and through the lower part at a slow rate. Surface runoff is rapid. The available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In the areas used as woodland, the erosion hazard and the equipment limitation are management concerns because of the slope. Plant competition restricts the growth of desirable seedlings. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

Areas used for paths and trails are subject to intensive foot traffic. They should be protected against erosion by mulching.

The land capability classification is VIIe.

562—Port Byron silt loam, sandy substratum. This nearly level, well drained soil is in broad areas on outwash plains. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 7 inches thick. The subsurface layer is black and dark brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown, friable silt loam about 26 inches thick. It is mottled in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, mottled, loose sand. In some areas the subsoil contains more sand. In other areas the depth to sand is more than 60 inches. In some places the substratum is stratified and contains less sand. In other places the seasonal high water table is within a depth of 4 feet during the spring.

Included with this soil in mapping are small areas of the poorly drained Drummer and Orio, somewhat poorly drained Joy, and well drained Waukegan soils. Drummer and Orio soils are lower on the landscape than the Port Byron soil. Joy soils are slightly lower on the landscape than the Port Byron soil. Waukegan soils are in landscape positions similar to those of the Port Byron soil or are in the more sloping areas. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Port Byron soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, septic tank absorption fields, and dwellings.

This soil has few limitations if it is used for corn, soybeans, or small grain. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is I.

564A—Waukegan silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on low ridges on outwash plains and moraines. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer also is very dark brown, friable silt loam. It is about 8 inches thick. The subsoil is about 17 inches thick. It is dark brown and yellowish brown and is friable. The upper part is silt loam. The lower part is sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface soil and subsoil contain more sand. In other areas calcareous gravel is within a depth of 60 inches. In places the soil does not have a sandy substratum within a depth of 40 inches.

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

Water and air move through the upper part of the Waukegan soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential and the potential for frost action are low.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

564B2—Waukegan silt loam, 2 to 5 percent slopes, eroded. This gently sloping, well drained soil is on low ridges on outwash plains, moraines, and stream terraces. Individual areas are long and narrow or irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 24 inches thick. The upper part is dark yellowish brown, friable silt loam. The lower part is yellowish brown, very friable sandy loam and loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose sand. In some areas the surface soil is thicker. In other areas the surface layer and subsoil contain more sand. In some places calcareous gravel is within a depth of 60 inches. In other places the soil does not have a sandy substratum within a depth of 40 inches.

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

Water and air move through the upper part of the Waukegan soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential and the potential for frost action are low.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIe.

564C2—Waukegan silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on knolls and the side slopes of ridges on outwash plains and moraines. Individual areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is mixed very dark grayish brown and dark yellowish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 41 inches thick. The upper part is dark brown, friable silt loam. The next part is dark yellowish brown, friable silt loam and loam. The lower part is dark yellowish brown, very friable loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose loamy sand and sand. In some areas the surface layer and subsoil contain more sand. In other areas the surface soil is thicker. In some places gravel is below a depth of 40 inches. In other places the sandy material is below a depth of 40 inches.

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

Water and air move through the upper part of the Waukegan soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential and the potential for frost action are low.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion. Because of the limited available water capacity, irrigation may be advantageous.

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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIIe.

565A—Tell silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on low ridges 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 dark brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 21 inches thick. It is yellowish brown and friable. The upper part is silt loam. The next part is silty clay loam. The lower part is sandy loam. The substratum to a depth of 60 inches or more is yellowish brown, loose loamy sand. In some areas the surface layer is darker. In other areas the substratum contains less sand. In places the subsoil contains more sand throughout.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawler and poorly drained Orio soils. Lawler soils are lower on the landscape than the Tell soil. Orio soils are in depressions below the Tell soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Tell soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

565B—Tell silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on low ridges on outwash plains and stream terraces. Individual areas are long and narrow or irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. It is yellowish brown. The upper part is friable silt loam and silty clay loam. The next part is friable loam. The lower part is very friable loamy sand. The substratum to a depth of 60 inches or more is yellowish brown, loose loamy sand. In some areas the surface layer is darker. In other areas the substratum is stratified and contains less sand. In places the subsoil contains more sand throughout.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawler, well drained Oakville, and poorly drained Orio soils. Lawler soils are lower on the landscape than the Tell soil. Oakville soils are more droughty than the Tell soil. Also, they are higher on the landscape. Orio soils are in depressions below the Tell soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Tell soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is medium. The available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard and the moderate available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion, conserve moisture, and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIe.

567C2—Elkhart silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregular in shape and range from 5 to 120 acres in size.

Typically, the surface layer is mixed dark brown and brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 26 inches thick. It is friable. The upper part is brown silty clay loam. The next part is yellowish brown silty clay loam that has relict mottles. The lower part is yellowish brown silt loam that has relict mottles. The substratum to a depth of 60 inches or more is brownish yellow, friable, calcareous silt loam that has relict mottles. In some areas the surface layer is light colored. In other areas the subsoil is thicker. In some places the surface layer is silty clay loam. In other places the subsoil contains less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are on narrow flood plains below the Elkhart soil. Also included are small areas of soils that are calcareous in the surface layer. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Elkhart soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is very high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIIe.

567C3—Elkhart silty clay loam, 5 to 10 percent slopes, severely eroded. This sloping, well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is mixed dark brown and brown silty clay loam about 7 inches thick. The subsoil is about 26 inches thick. It is friable. The upper part is dark yellowish brown and dark brown silty clay loam. The next part is yellowish brown silty clay loam. The lower part is yellowish brown silt loam. The substratum to a depth of 60 inches or more is yellowish brown, calcareous silt loam. In some areas the surface layer is light colored. In other areas the subsoil is thicker. In places it contains less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are in narrow drainageways below the Elkhart soil. Also included are small areas of soils that are calcareous in the surface layer and areas of somewhat poorly drained, slowly permeable soils that are in landscape positions similar to those of the Elkhart soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Elkhart soil at a moderate rate. In cultivated areas surface runoff is medium. The available water capacity is very high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops and to dwellings without basements. It is well suited to dwellings with basements and to septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation that includes grasses and legumes helps to control erosion.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IVe.

567D3—Elkhart silty clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is mixed dark yellowish brown and dark brown silty clay loam about 7 inches thick. The subsoil is about 14 inches thick. It is yellowish brown and friable. The upper part is silty clay loam. The lower part is silt loam. The substratum to a depth of 60 inches or more is brownish yellow, calcareous silt loam. In some areas the surface layer is light colored. In other areas the subsoil is thicker. In places it contains less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Radford soils. These soils are in narrow drainageways below the Elkhart soil. Also included are small areas of soils that are calcareous in the surface layer and small areas of somewhat poorly drained, slowly permeable soils that are in landscape positions similar to those of the Elkhart soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Elkhart soil at a moderate rate. Surface runoff is rapid. The available water capacity is very high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, further water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and grassed waterways help to control erosion, minimize crusting, and maintain tilth and fertility. A crop rotation dominated by grasses and legumes helps to control erosion.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. The shrink-swell potential also is a limitation on sites for dwellings without basements. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The land capability classification is IVe.

570B—Martinsville silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is yellowish brown, friable silt loam about 3 inches thick. The subsoil is about 43 inches thick. It is firm. The upper part is yellowish brown clay loam. The next part is brown clay loam. The lower part is brown, mottled clay loam and stratified sandy loam and loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, friable loam. In some areas the lower part of the subsoil and the substratum contain more gravel. In other areas the stratified, loamy material is below a depth of 60 inches.

Included with this soil in mapping are small areas of the well drained Lamont and somewhat poorly drained La Hogue soils. La Hogue soils have a surface layer that is darker than that of the Martinsville soil. Also, they are slightly lower on the landscape. Lamont soils have more sand throughout than the Martinsville soil. They are in landscape positions similar to those of the Martinsville soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Martinsville soil at a moderate rate and through the lower part at a moderate or moderately rapid rate. In cultivated areas surface runoff is medium. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, water erosion is a hazard. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and grassed waterways help to control erosion and maintain tilth and fertility.

The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is IIe.

575—Joy silt loam, sandy substratum. This nearly level, somewhat poorly drained soil is in low areas on outwash plains. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 12 inches thick. The subsurface layer is very dark grayish brown and grayish brown, friable silt loam about 7 inches thick. The subsoil is grayish brown, friable silt loam about 22 inches thick. The substratum to a depth of 60 inches or more is dark brown, mottled, loose loamy sand. In some areas the subsoil contains more sand. In other areas the substratum is stratified with loamy material. In places the seasonal high water table is below a depth of 4 feet during the spring. In a few places the soil does not have sandy material within a depth of 60 inches.

Included with this soil in mapping are small areas of the well drained Port Byron and Waukegan and poorly drained Drummer, Selma, and Orio soils. Port Byron and Waukegan soils are slightly higher on the landscape than the Joy soil. Drummer and Selma soils are slightly lower on the landscape than the Joy soil. Orio soils are in depressions below the Joy soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Joy soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 2 to 4 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the seasonal high water table can delay planting in some years. A drainage system can function satisfactorily if suitable outlets are available. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The seasonal high water table is a limitation on sites for dwellings and septic tank absorption fields. Subsurface drains around foundations can help to remove excess water from building sites. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Installing curtain drains and either mounding or raising the site with suitable fill material help to overcome the wetness in septic tank absorption fields.

The land capability classification is I.

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

Typically, the surface layer is very dark brown, friable silt loam about 10 inches thick. The subsoil is about 28 inches thick. It is mottled. The upper part is dark brown and brown, friable silt loam. The next part is grayish brown, friable loam. The lower part is dark yellowish brown, very friable sand. The substratum to a depth of 60 inches or more is dark yellowish brown, mottled, loose sand. In some areas the subsoil contains more sand. In other areas the surface layer is thinner. In places the seasonal high water table is below a depth of 4 feet during the spring.

Included with this soil in mapping are small areas of the poorly drained Orio and Selma and well drained Waukegan soils. Orio soils are in depressions below the Lawler soil. Waukegan soils are slightly higher on the landscape than the Lawler soil. Selma soils are slightly lower on the landscape than the Lawler soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Lawler soil at a moderate rate and through the lower part at a very rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 2 to 4 feet below the surface during the spring. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation and the seasonal high water table may be a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture, minimize crusting, and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous. A drainage system is needed in some areas. Subsurface drains can function satisfactorily if suitable outlets are available. Enclosing the subsurface drains with filtering material can keep sand from clogging tile lines.

The seasonal high water table is a limitation on sites for dwellings. The shrink-swell potential also is a limitation on sites for dwellings without basements. Subsurface drains around the foundation of buildings can help to remove excess water. Enclosing the drains with filtering material can keep sand from clogging tile lines. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

The seasonal high water table and a poor filtering capacity are limitations on sites for septic tank absorption fields. Curtain drains can help to remove excess water from the absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

741B—Oakville fine sand, 1 to 7 percent slopes. This gently sloping, well drained soil is on dunes on outwash plains and moraines. Individual areas are long and narrow or irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown, very friable fine sand about 6 inches thick. The subsoil is yellowish brown, very friable fine sand about 30 inches thick. The substratum to a depth of 60 inches or more is yellowish brown, loose fine sand. It is calcareous in the lower part. In some areas the surface layer is darker. In other areas the subsoil has more clay and less sand. In places the substratum has thin bands of loamy sand.

Included with this soil in mapping are small areas of the poorly drained Orio and well drained Tell and Waukegan soils. Orio soils are in depressions below the Oakville soil. Tell and Waukegan soils have a surface layer and subsoil of silt loam and are less droughty than the Oakville soil. Also, they are lower on the landscape. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Oakville soil at a rapid rate. In cultivated areas surface runoff is very slow. The available water capacity and organic matter content are low. The shrink-swell potential and the potential for frost action also are low.

Most areas are cultivated. This soil is poorly suited to cultivated crops, septic tank absorption fields, and woodland. It is well suited to dwellings and to hay and pasture. It is moderately suited to woodland. It is a probable source of sand.

In areas used for corn, soybeans, or small grain, soil blowing and water erosion are hazards and the low available water capacity is a limitation. Zero tillage or another system of conservation tillage that leaves crop residue on the surface after planting, contour farming, grassed waterways, cover crops, and field windbreaks help to control soil blowing and water erosion. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of 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, and 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IVs.

741D—Oakville fine sand, 7 to 20 percent slopes. This strongly sloping, well drained soil is on outwash plains and moraines. Individual areas are long and narrow or irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, very friable fine sand about 5 inches thick. The subsoil is about 31 inches thick. It is very friable. The upper part is strong brown. The lower part is yellowish brown. 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 substratum is calcareous. In some places the soil contains more clay and less sand. In other places the substratum has thin bands of loamy fine sand. In some areas the slope is more than 20 percent.

Included with this soil in mapping are small areas of the poorly drained Orio and well drained Tell and Waukegan soils. Orio soils are in depressions below the Oakville soil. Tell and Waukegan soils are downslope from the Oakville soil. They have a surface layer and subsoil of silt loam. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Oakville soil at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity and organic matter content are low. The shrink-swell potential and the potential for frost action also are low.

Most areas are used as pasture. This soil is moderately suited to hay, pasture, woodland wildlife habitat, and dwellings. It is poorly suited to woodland and septic tank absorption fields. It is unsuitable as cropland because of the low available water capacity and the slope. It is a probable source of sand.

In the areas used for hay or pasture, soil blowing and water erosion are hazards and the low available water capacity is a limitation, particularly during establishment. Seeding of the pasture or hayland, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control soil blowing and water erosion. Planting drought-resistant species of grasses and legumes can help in establishing a plant cover. Because of the limited available water capacity, irrigation may be advantageous.

If this soil is used as woodland, seedling mortality is a management concern because of 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, and by mulching. Competing vegetation can be controlled by chemical or mechanical means. In areas where the slope is more than 15 percent, erosion is a hazard and the use of equipment is limited. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. Establishing wildlife food plots and additional cover is difficult because of the low available water capacity and low fertility. Drought-resistant plant species can be used for wildlife cover. Measures that protect the habitat from fire and from grazing by livestock are essential.

If this soil is used as a site for dwellings, the slope is a limitation and erosion is a hazard. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established helps to control soil blowing and water erosion.

The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Land shaping and installing a sealed sand filter and a disinfection tank help to overcome these limitations.

The land capability classification is VIs.

767—Prophetstown silt loam. This nearly level or depressional, poorly drained soil is on outwash plains. It is ponded for brief periods from March through May. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is black, friable, calcareous silt loam about 8 inches thick. The subsurface layer also is black, friable, calcareous silt loam. It is about 5 inches thick. The subsoil is friable, calcareous silt loam about 16 inches thick. The upper part is dark gray and dark grayish brown. The lower part is light brownish gray and mottled. The substratum to a depth of 60 inches or more is mottled, friable, and calcareous. The upper part is grayish brown silt loam. The lower part is dark grayish brown, stratified loam and sand. In some areas the dark surface soil is thinner. In other areas sand or loamy sand is within a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in landscape positions similar to those of the Prophetstown soil. They are not calcareous within a depth of 40 inches. They make up 5 to 10 percent of the unit.

Water and air move through the Prophetstown soil at a moderate rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is very high. Organic matter content is high. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. A high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium and the effectiveness of herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. Adjusting the rate of herbicide application can help to compensate for the high pH. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

770—Udolpho silt loam. This nearly level, somewhat poorly drained soil is on loess-covered outwash plains. Individual areas are irregular in shape and range from 5 to 50 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 7 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is yellowish brown, friable silty clay loam. The next part is grayish brown, friable sandy loam. The lower part is brown, very friable, stratified loamy sand and sand. The substratum to a depth of 60 inches or more is stratified brown and dark brown, mottled, loose sand and loamy sand. In some areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the well drained Lamont, Tell, and Waukegan soils. These soils are higher on the landscape than the Udolpho soil. Also, Lamont soils have a lighter colored surface layer and contain more sand in the upper part. Tell soils have a light colored surface layer. Waukegan soils have a dark surface soil that is thicker than that of the Udolpho soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Udolpho soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is l to 3 feet below the surface during the spring. The available water capacity and organic matter content are moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

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

In areas used for corn, soybeans, or small grain, the moderate available water capacity is a limitation. Also, the seasonal high water table can delay planting in some years. A conservation tillage system that leaves crop residue on the surface after planting helps to conserve moisture and maintain tilth and fertility. Because of the limited available water capacity, irrigation may be advantageous. Subsurface drains can function satisfactorily if suitable outlets are available. Enclosing the drains with filtering material can keep sand from clogging tile lines.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 seasonal high water table is a limitation on sites for dwellings. The shrink-swell potential also is a limitation on sites for dwellings without basements. Subsurface drains around the foundation of buildings can help to remove excess water. Reinforcing the foundation 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 curtain drains and either mounding or raising the site with suitable fill material help to overcome this limitation.

The land capability classification is IIw.

802B—Orthents, loamy, undulating. These soils are in areas that have been disturbed by filling and excavating for highway interchanges and urban development. Soil borings in these areas indicate that the soil material does not occur in a consistent pattern. Slope generally ranges from 1 to 7 percent. Individual areas are rectangular and range from 5 to 150 acres in size.

The mixed soil material in this unit generally is sandy loam to clay loam and commonly is 2 to more than 5 feet thick. Some areas are mixed with sand, gravel, refuse, and other nonsoil material. Some are sanitary landfills. In places the slope ranges to as much as 60 percent.

Included with these soils in mapping are small areas of the undisturbed La Rose, Miami, Catlin, and Drummer soils. These included soils make up less than 15 percent of the unit.

Permeability varies in the Orthents because of the varying degrees of compaction caused by heavy equipment and because of the variety of textures. The available water capacity is moderate. Organic matter content and natural fertility are low.

Most areas are used as sites for industrial development, small commercial buildings, or recreational facilities. These soils are moderately suited to small commercial buildings, dwellings, recreational facilities, wildlife habitat, and woodland. They are poorly suited to septic tank absorption fields.

Some areas of these soils are subject to settling. The base material should be thoroughly mixed and compacted when buildings are constructed in these areas. Dangerous gases and leachates may be released in areas that contain buried refuse. Covering the areas with impervious material can help to prevent leakage of the gases. Removing a minimum of vegetation, mulching, and promptly reestablishing vegetation help to control erosion during construction.

Seeding a grass-legume mixture helps to control erosion. Applications of fertilizer are needed for optimum plant growth. Undesirable woody plants can be replaced with desirable trees and shrubs.

This map unit is not assigned a land capability classification.

808E—Orthents, gravelly sand, hilly. These soils are in areas that have been excavated for gravel. Soil borings in these areas indicate that the soil material does not occur in a consistent pattern. Slope generally ranges from 12 to 30 percent. Individual areas are irregular in shape and range from 5 to 50 acres in size.

The mixed soil material in this unit is gravelly and sandy and commonly is 2 to more than 5 feet thick. Some areas are mixed with refuse and other nonsoil material. Some have been excavated for sand. In some places the slope is less than 12 percent. In other places it is more than 30 percent.

Included with these soils in mapping are small areas of the undisturbed Hononegah, Sparta, Warsaw, and Waukegan soils. These included soils make up less than 15 percent of the unit.

Permeability varies in the Orthents because of the varying degrees of compaction caused by heavy equipment and because of the variety of textures. The available water capacity is low or very low. Organic matter content and natural fertility are very low.

Most areas are used as sites for recreational facilities or as wildlife habitat. These soils are poorly suited to small commercial buildings, septic tank absorption fields, and dwellings because of the slope and a poor filtering capacity in the soil and nonsoil material. They are moderately suited to recreational facilities, wildlife habitat, and woodland.

Seeding a grass-legume mixture that is suited to a wide range of soil conditions, especially droughty conditions, helps to establish desirable vegetation. Applications of fertilizer are needed for optimum plant growth. Undesirable woody plants can be replaced with desirable trees and shrubs.

This map unit is not assigned a land capability classification.

820E—Hennepin-Casco complex, 12 to 25 percent slopes. These moderately steep soils are on side slopes along drainageways in the uplands. The somewhat excessively drained Casco soil is higher on the side slopes than the well drained Hennepin soil. Individual areas are long and narrow or irregular in shape and range from 5 to 50 acres in size. They are about 60 percent Hennepin soil and 40 percent Casco soil. The two soils occur as areas so small that mapping them separately is not practical.

Typically, the surface layer of the Hennepin soil is very dark grayish brown, friable loam about 5 inches thick. The subsoil is friable loam about 13 inches thick. The upper part is brown. The lower part is yellowish brown. The substratum to a depth of 60 inches or more is brown, calcareous, friable loam. In some areas the subsoil is thicker and contains more clay. In other areas the surface layer is silt loam.

Typically, the surface layer of the Casco soil is very dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 18 inches thick. It is friable. The upper part is brown loam. The next part is gravelly clay loam. The lower part is very gravelly sandy clay loam. The substratum to a depth of 60 inches or more is loose gravelly sand. In some areas the gravelly and sandy substratum is below a depth of 40 inches. In other areas the content of gravel is lower in the substratum. In places the substratum is calcareous loam.

Included with these soils in mapping are small areas of the well drained Fayette and moderately well drained Minneiska and Rozetta soils. Fayette and Rozetta soils are silty to a depth of 60 inches. They are upslope from the Hennepin and Casco soils. Minneiska soils are on narrow flood plains below the Hennepin and Casco soils. Also included are seepy spots of organic soils at the contact point of the sand and gravel and the underlying loamy glacial till. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Hennepin and Casco soils at a moderate rate, through the lower part of the Hennepin soil at a moderately slow rate, and through the lower part of the Casco soil at a very rapid rate. Surface runoff is very rapid on both soils. The available water capacity is moderate in the Hennepin soil and low in the Casco soil. Organic matter content is moderately low in both soils. Root growth is restricted by the calcareous loam glacial till below a depth of about 18 inches in the Hennepin soil and by the calcareous gravelly sand below a depth of about 24 inches in the Casco soil. The shrink-swell potential is low in the Hennepin soil and moderate in the Casco soil. The potential for frost action is moderate in the Hennepin soil and low in the Casco soil.

Most areas are used as pasture. Some remain native woodland. These soils are unsuited to cultivated crops, hay, septic tank absorption fields, and dwellings because of the slope. They are poorly suited to pasture. They are moderately suited to woodland. They are well suited to woodland wildlife habitat.

In the areas used as pasture, seeding and renovating on the contour, deferring grazing, stocking at a proper rate, applying fertilizer, and rotation grazing help to control erosion, increase forage production, and help to prevent surface compaction.

In the areas used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition restricts the growth of desirable seedlings. Seedling mortality is a concern in areas of the Casco soil. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soils are firm. Planting mature nursery stock and clearing all vegetation within 2 feet of the planted seedlings reduce the seedling mortality rate. Some replanting may be necessary. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

Areas used for paths and trails are subject to intensive foot traffic. They should be protected against erosion by mulching.

The land capability classification is VIe.

820G—Hennepin-Casco complex, 25 to 60 percent slopes. These very steep soils are on side slopes along drainageways in the uplands. The somewhat excessively drained Casco soil is higher on the side slopes than the well drained Hennepin soil. Individual areas are long and narrow or irregular in shape and range from 5 to 100 acres in size. They are about 60 percent Hennepin soil and 40 percent Casco soil. These two soils occur as areas so small that mapping them separately is not practical.

Typically, the surface layer of the Hennepin soil is very dark grayish brown, friable loam about 5 inches thick. The subsoil is friable brown loam about 11 inches thick. It is calcareous in the lower part. The substratum to a depth of 60 inches or more is dark brown, firm, calcareous loam. In some areas, the subsoil is thicker and carbonates are below a depth of 20 inches.

Typically, the surface layer of the Casco soil is dark brown, friable silt loam about 7 inches thick. The subsoil is brown, friable, calcareous very gravelly loam about 8 inches thick. The substratum to a depth of 60 inches or more is loose, calcareous, stratified sand and gravel. The upper part is dark yellowish brown. The lower part is yellowish brown. In some areas the soil does not have sand and gravel within a depth of 20 inches. In other areas the surface layer is sandy or gravelly. In some places calcareous loam till is within a depth of 40 inches. In other places the subsoil and substratum contain less sand and more clay.

Included with these soils in mapping are small areas of the well drained Fayette and moderately well drained Minneiska and Rozetta soils. Fayette and Rozetta soils are silty to a depth of 60 inches or more. They are upslope from the Hennepin and Casco soils. Minneiska soils are on narrow flood plains below the Hennepin and Casco soils. Also included are seepy spots of organic soils at the contact point of the sand and gravel and the underlying loamy glacial till. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Hennepin and Casco soils at a moderate rate, through the lower part of the Hennepin soil at a moderately slow rate, and through the lower part of the Casco soil at a very rapid rate. Surface runoff is very rapid on both soils. The available water capacity is moderate in the Hennepin soil and low in the Casco soil. Organic matter content is moderately low in both soils. Root growth is restricted by the calcareous loam glacial till below a depth of about 16 inches in the Hennepin soil and by the sand and gravel below a depth of about 15 inches in the Casco soil. The shrink-swell potential is low in the Hennepin soil and moderate in the Casco soil. The potential for frost action is moderate in the Hennepin soil and low in the Casco soil.

Most areas are used as woodland wildlife habitat. These soils are well suited to woodland wildlife habitat and are poorly suited to woodland. They are unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the slope.

In areas used as woodland, the erosion hazard and the equipment limitation are management concerns. Plant competition restricts the growth of desirable seedlings. Seedling mortality is a concern in areas of the Casco soil. Erosion can be controlled by laying out logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soils are firm. Planting mature nursery stock and clearing all vegetation within 2 feet of the planted seedlings reduce the seedling mortality rate. Some replanting may be necessary. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Establishing wildlife food plots and additional cover is difficult because of the slope. Planting on the contour and maintaining a ground cover help to control erosion. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

The land capability classification is VIIe.

865—Pits, gravel. This map unit consists of excavations from which gravel and sand have been removed and the adjacent stockpile areas. It is in outwash areas and on stream terraces. Individual areas range from 5 to 50 acres in size.

The soil material in this map unit is sandy and gravelly. The excavations are 10 to 80 feet deep. The pits support little or no vegetation. Those that are filled with water are identified as water on the soil maps.

Included in this unit in mapping are small areas of Orthents. These soils support vegetation. They are in areas where mine spoil has been mixed with soil material. They make up less than 15 percent of the unit.

Water and air move through the sandy and gravelly material at a rapid or very rapid rate. The available water capacity is very low. Organic matter content and natural fertility also are very low.

Most areas that are not currently being mined are used for recreation. Some areas are mined. This unit is moderately suited to recreational uses. It is poorly suited to sanitary landfills. Stocking the water-filled pits with fish and planting trees in other areas of this unit improve the suitability for recreational development. Topdressing and grading disturbed areas help to establish vegetation.

This map unit is not assigned a land capability classification.

871C—Lenzburg silty clay loam, 4 to 12 percent slopes, stony. This sloping, well drained soil is in areas of cast overburden material derived from surface mining. The landscape has been altered by some leveling or land shaping. Stones that are larger than 10 inches in diameter and are 3 to 15 feet apart cover about l percent of the surface. Slopes are generally 100 to 200 feet long. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown and olive gray, friable silty clay loam about 3 inches thick. The substratum to a depth of 60 inches or more is mixed light olive brown and olive gray, calcareous, and firm. The upper part is channery clay loam. The lower part is channery silty clay loam. Shale channers are common throughout the profile. Some areas have stones as large as 15 inches in diameter on the surface.

Included with this soil in mapping are roads and lanes that were used for hauling coal. Also included are some scattered areas that are steep and very steep, areas adjacent to pits, areas next to the final cut, and shallow trenches and depressions that commonly contain water. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. In areas used as pasture, surface runoff is rapid. The available water capacity is moderate. Organic mater content is low. The supply of available phosphorous also is low. The content of stones and channers is as much as 35 percent, by volume. Crusting and sealing of the surface layer are common after hard rains. Some areas are subject to differential settling and slumping. The substratum somewhat limits root growth. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used as pasture. Some of the acreage is idle land. This soil is well suited to pasture and hay and to habitat for openland and woodland wildlife. It is moderately suited to dwellings. It is poorly suited to septic tank absorption fields. It generally is unsuited to cultivated crops because of the large stones in the surface layer.

The plants grazed by livestock or harvested for hay grow well on this soil. Erosion is a hazard. The short slopes, the depressions, and the stones on the surface are limitations. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture soil in good condition and help to control erosion. Applying a no-till method of pasture renovation or seeding on the contour helps to control erosion. Allowing sufficient time for establishment before the pasture or hayland is grazed or clipped helps to obtain a good stand of forage. In places seed must be planted and fertilizer applied by airplane or by hand because some slopes are short and steep and some areas are isolated by trenches or depressions. Overgrazing causes surface compaction and excessive runoff and thus increases the susceptibility to erosion.

This soil is suitable for the grain and seed crops and the legumes and grasses necessary for openland wildlife. Examples of suitable grasses and legumes are bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. Measures that protect the habitat from grazing are essential. The shallow depressions and occasional areas of deep water provide nesting areas for waterfowl. Some of the areas of deep water are used for fishing and boating.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations and erosion is a hazard. Reinforcing the foundation of buildings helps to prevent the structural damage caused by shrinking and swelling. Grading may be needed to prepare sites for dwellings. Sediment trap basins are needed during construction to minimize the sedimentation of surface water. Maintaining a cover of mulch until seedlings are established can reduce the hazard of erosion.

The moderately slow permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field helps to overcome this limitation.

The land capability classification is VIe.

871G—Lenzburg silty clay loam, 30 to 60 percent slopes, stony. This very steep, well drained soil is on linear, parallel ridges in areas of ungraded cast overburden material derived from surface mining. Slopes are generally 50 to 100 feet long. Trenches and depressions separate the spoil banks. They commonly contain water. Stones that are larger than 10 inches in diameter and are 3 to 10 feet apart cover about l percent of the surface. Individual areas are irregular in shape and range from 10 to 600 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 3 inches thick. The upper part of the substratum is gray and pale olive, calcareous, firm silty clay loam. The next part is pale olive, calcareous, firm channery silty clay loam. The lower part to a depth of 60 inches or more is brown, calcareous, firm very channery clay loam. Shale channers are common throughout the profile. In some areas the ridgetops have been removed.

Included with this soil in mapping are haulage roads and construction areas where coal-processing machinery was located during mining activities. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is very rapid. The available water capacity is moderate. Organic matter content is low. The supply of available phosphorous also is low. The content of stones and channers is as much as 50 percent, by volume. Crusting and sealing of the surface layer are common after hard rains. Some areas are subject to differential settling and slumping. The substratum restricts the root penetration of some plants. The shrink-swell potential and the potential for frost action are moderate.

Most of the acreage is idle land. Some areas support dense stands of timber or are used as pasture. This soil is well suited to woodland wildlife habitat. It is poorly suited to pasture. It generally is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the slope.

Erosion is the major hazard if this soil is used as pasture. Large machinery generally cannot cross areas of this soil because of the short, very steep slopes. Seed must be planted, fertilizer applied, and herbicide sprayed by airplane or by hand. Maintaining some kind of ground cover helps to control erosion. Proper stocking rates, timely deferment of grazing, applications of fertilizer, and rotation grazing help to keep the pasture in good condition and help to control erosion.

The dense stands of timber provide good habitat for woodland wildlife. This soil is suitable for grain and seed crops, wild herbaceous plants, and hardwoods. Measures that protect the habitat from fire and from grazing by livestock help to prevent depletion of the shrubs and sprouts that provide food for wildlife. The numerous shallow ponds and areas of deep water provide opportunities for fishing and boating. A large number of Canada geese and ducks use the shallow ponds and surrounding cover for nesting. Some of the nearly level areas where ridgetops have been removed are well suited to hiking trails.

The land capability classification is VIIe.

1480—Moundprairie silty clay loam, wet. This nearly level, very poorly drained soil is on flood plains along the major streams. It is frequently flooded for brief periods from March through June and is ponded for brief to long periods from March through November. Individual areas are irregular in shape and range from 20 to 5,000 acres in size.

Typically, the surface layer is black, friable, calcareous silty clay loam about 9 inches thick. The substratum to a depth of 60 inches or more is friable, calcareous, and stratified. In sequence downward, it is black silty clay loam and dark grayish brown silt loam; very dark gray silty clay loam and dark grayish brown silt loam; and very dark grayish brown and dark grayish brown silt loam, loam, and loamy sand. In some areas the soil contains less clay. In other areas the substratum contains more sand.

Water and air move through this soil at a moderate rate. Surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during much of the growing season. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are wooded and are used for duck and deer hunting. This soil is moderately suited to woodland and to woodland wildlife habitat. It is well suited to wetland wildlife habitat. It is unsuited to dwellings and septic tank absorption fields because of the flooding.

In the areas used as woodland, the seasonal high water limits the use of equipment and plant competition is a management concern. The use of equipment is limited to periods when the soil is firm and dry. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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.

Areas of this soil provide good habitat for wetland wildlife. The naturally occurring plant species should be maintained. They furnish good food and cover for waterfowl and many other wildlife species. Measures that protect the habitat from fire and from grazing by livestock are essential. Where open water is not available, constructing irregularly shaped areas of open water 2 to 4 feet deep can improve the habitat if about two-thirds of the area remains vegetated with wetland plants. Erosion control in the adjacent uplands helps to control sedimentation in the wetlands.

The land capability classification is Vw.

3179—Minneiska loam, frequently flooded. This nearly level, moderately well drained soil is on flood plains along streams. It is frequently flooded for brief periods from March through July. Individual areas are long and narrow and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable, calcareous loam about 7 inches thick. The substratum to a depth of 60 inches or more is stratified very dark grayish brown, brown, dark brown, and dark grayish brown, mottled, friable, calcareous loam, fine sandy loam, loamy fine sand, and sand. In some areas calcareous gravel is within a depth of 60 inches.

Included with this soil in mapping are small areas of the very poorly drained Moundprairie soils and the well drained, rarely flooded Landes soils. Moundprairie soils are in landscape positions similar to those of the Minneiska soil. Landes soils are higher on the landscape than the Minneiska soil. Also included, on shore lines along streams, are soils that are gravelly throughout. Included soils make up 2 to 5 percent of the unit.

Water and air move through the Minneiska soil at a moderately rapid rate. Surface runoff is slow. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity and organic matter content are moderate. The shrink-swell potential and the potential for frost action also are moderate.

Most areas are used as woodland wildlife habitat. This soil is well suited to woodland wildlife habitat and to woodland. It is unsuited to cultivated crops, hay, pasture, septic tank absorption fields, and dwellings because of the frequent flooding.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 development of woodland wildlife habitat depends on the maintenance of naturally occurring plant species. The greatest diversity of wildlife species can be achieved by managing for a wide diversity of tree and shrub species. Dead trees, fallen logs, and brush piles should be left for cover and nesting sites. Measures that protect the habitat from fire and from grazing by livestock are essential.

The land capability classification is Vw.

3480—Moundprairie silty clay loam, frequently flooded. This nearly level, poorly drained soil is on flood plains along the major streams. It is frequently flooded for brief periods from March through June. Individual areas are irregular in shape and range from 10 to 1,000 acres in size.

Typically, the surface layer is very dark gray, friable loam about 9 inches thick. The substratum extends to a buried soil at a depth of about 43 inches. It is friable, calcareous, and mottled. The upper part is very dark gray and dark grayish brown, stratified silty clay loam and loam. The next part is very dark gray, grayish brown, and dark grayish brown, stratified silty clay loam, loam, and sandy loam. The lower part is very dark gray and dark grayish brown, stratified silty clay loam and loam. The buried soil to a depth of 60 inches or more is black silty clay loam. In some areas the soil contains less clay throughout. In other areas it contains more sand throughout.

Included with this soil in mapping are small areas of soils that are ponded for long periods. These soils are slightly lower on the landscape than the Moundprairie soil. They make up 10 to 15 percent of the unit.

Water and air move through the Moundprairie soil at a moderate rate. Surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops and to habitat for wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Flooding occurs less often than once in 2 years during the growing season, but it can delay planting. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIIw.

4125—Selma loam, ponded. This nearly level, poorly drained soil is in depressions on outwash plains. It is ponded for long periods. Individual areas are oblong or oval and range from 2 to 80 acres in size.

Typically, the surface layer is black, friable loam about 11 inches thick. The subsurface layer is black, mottled, friable loam about 8 inches thick. The subsoil is about 22 inches thick. It is mottled and friable. The upper part is dark gray and gray loam. The lower part is gray sandy loam. The substratum to a depth of 60 inches or more is gray, stratified loamy sand and sandy loam. In some areas the subsoil contains less clay. In other areas it is thicker and contains more clay. In places the substratum is sand.

Included with this soil in mapping are small areas of soils that are not ponded for long periods. These soils are slightly higher on the landscape than the Selma soil. They 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 lower part at a moderately rapid rate. Surface runoff is very slow or ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during most of the growing season. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas support wetland plants. This soil is well suited to wetland wildlife habitat. It is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the ponding and the seasonal high water table.

Areas of this soil provide good habitat for wetland wildlife. The naturally occurring plant species should be maintained. They furnish good food and cover for waterfowl and many other wildlife species. Measures that protect the habitat from fire and from grazing by livestock are essential. Where open water is not available, constructing irregularly shaped areas of open water 2 to 4 feet deep can improve the habitat if about two-thirds of the area remains vegetated with wetland plants. Erosion control in the adjacent uplands helps to control sedimentation in the wetlands.

The land capability classification is Vw.

4210—Lena muck, ponded. This nearly level, very poorly drained soil is in depressions on outwash plains and glacial moraines. It is ponded for long periods. Individual areas are oblong or oval and range from 2 to 80 acres in size.

Typically, the surface layer is black, friable muck about 10 inches thick. The subsurface layer to a depth of 60 inches or more is dark grayish brown, friable, calcareous muck. In some areas marl is in the lower part of the profile. In other areas loamy sand or sand is below a depth of 40 inches.

Included with this soil in mapping are small areas of the very poorly drained Moundprairie soils. These soils are silty and loamy throughout. They are slightly higher on the landscape than the Lena soil. They make up 2 to 5 percent of the unit.

Water and air move through the Lena soil at a moderately rapid rate. Surface runoff is very slow or ponded. The seasonal high water table ranges from 1 foot above the surface to 1 foot below during most of the growing season. The available water capacity is very high. Organic matter content also is very high. The potential for frost action is high.

Most areas support wetland plants. This soil is well suited to wetland wildlife habitat (fig. 8). It is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the ponding and the seasonal high water table.

Areas of this soil provide good habitat for wetland wildlife. The naturally occurring plant species should be maintained. They furnish good food and cover for waterfowl and many other wildlife species. Measures that protect the habitat from fire and from grazing by livestock are essential. Where open water is not available, constructing irregularly shaped areas of open water 2 to 4 feet deep can improve the habitat if about two-thirds of the area remains vegetated with wetland plants. Erosion control in the adjacent uplands helps to control sedimentation in the wetlands.

The land capability classification is Vw.

7304—Landes fine sandy 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 brown, friable fine sandy loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable fine sandy loam about 9 inches thick. The subsoil is about 13 inches thick. The upper part is dark brown, 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 yellowish brown and calcareous. The upper part is very friable fine sandy loam. The lower part is loose sand. In some areas the soil contains more clay throughout. In other areas calcareous gravel is within a depth of 60 inches. In places the upper part of the soil is calcareous.

Included with this soil in mapping are small areas of Jasper soils. These soils are on terraces above the Landes soil. Also included are occasionally flooded soils that are slightly lower on the landscape than the Landes soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Landes soil at a moderately rapid rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The available water capacity is moderate.

Figure 8.—An area of Lena muck, ponded. This soil provides good habitat for a wide variety of wetland wildlife species.

Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is moderately suited to woodland. It is poorly suited to septic tank absorption fields. It is unsuited to dwellings because of the flooding.

In areas used for corn, soybeans, or small grain, soil blowing is a hazard and the moderate available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to control soil blowing and conserves moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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. Installing a sealed sand filter and a disinfection tank helps to overcome this limitation.

The land capability classification is IIs.

8125—Selma loam, occasionally flooded. This nearly level, poorly drained soil is on outwash plains. It is occasionally flooded and ponded for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 3,000 acres in size.

Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer also is black, friable loam. It is about 5 inches thick. The subsoil is about 32 inches thick. It is mottled and friable. The upper part is grayish brown loam. The next part is light brownish gray silt loam. The lower part is light brownish gray fine sandy loam. The substratum to a depth of 60 inches or more is calcareous. The upper part is grayish brown, very friable sandy loam. The lower part is pale brown, loose sand that has thin strata of silt loam. In some areas the subsoil contains less clay. In other areas the surface soil and subsoil contain less sand.

Included with this soil in mapping are small areas of the poorly drained Canisteo and very poorly drained Aurelius soils. Canisteo soils are calcareous. They are in landscape positions similar to those of the Selma soil or are in the slightly higher areas. Aurelius soils have an organic surface layer. They are slightly lower on the landscape than the Selma soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Selma soil at a moderate rate and through the lower part at a moderately rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is unsuited to dwellings and septic tank absorption fields because of the seasonal high water table and the rare flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Also, flooding can delay planting or damage crops in some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

8153—Pella silty clay loam, occasionally flooded. This nearly level, poorly drained soil is on outwash plains. It is occasionally flooded and ponded 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 black, mottled, friable silty clay loam about 10 inches thick. The subsoil is about 15 inches thick. It is mottled and friable. The upper part is grayish brown silty clay loam. The lower part is light brownish gray, calcareous silt loam. The substratum to a depth of 60 inches or more is calcareous. The upper part is light brownish gray loam and stratified fine sandy loam and loam. The lower part is mottled brown and yellowish brown, stratified silt loam and sand. In some areas the soil is not calcareous within a depth of 40 inches. In other areas the surface soil and subsoil contain more sand. In places the soil does not have stratified, loamy material within a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Canisteo and very poorly drained Aurelius soils. Canisteo soils are calcareous throughout. They are in landscape positions similar to those of the Pella soil or are in the slightly higher areas. Aurelius soils have an organic surface layer. They are slightly lower on the landscape than the Pella soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Pella soil at a moderate rate and through the lower part at a moderately rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. The available water capacity is high. Organic matter content also is high. The surface layer is friable but becomes hard and cloddy if tilled when wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It is unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed. In some areas, however, the seasonal high water table is a limitation. Also, flooding can delay planting or damage crops in some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The land capability classification is IIw.

8179—Minneiska loam, occasionally flooded. This nearly level, moderately well drained soil is on flood plains. It is occasionally flooded from March through July. Individual areas are long and narrow and range from 2 to 120 acres in size.

Typically, the surface layer is very dark grayish brown, friable, calcareous loam about 8 inches thick. The substratum extends to a depth of more than 60 inches. It is friable to loose and is calcareous. The upper part is very dark grayish brown silt loam that has thin strata of dark brown and very dark gray silt loam and very fine sand. The next part is very dark grayish brown loam that has thin strata of dark brown sand. The lower part is dark brown, stratified sand, loam, and silt loam. In some places the soil contains less sand throughout. In other places it contains more sand throughout.

Included with this soil in mapping are small areas of the well drained Jasper and Ross soils. These soils are not calcareous within a depth of 40 inches. They contain more clay and less sand in the upper part than the Minneiska soil. They are in areas above the Minneiska soil that are not flooded or are only rarely flooded. Also included are a few small areas of soils that have calcareous gravel within a depth of 30 inches. These soils are in landscape positions similar to those of the Minneiska soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Minneiska soil at a moderately rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 3 to 6 feet below the surface during the spring. The available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, and pasture. It is poorly suited to woodland. It is unsuited to dwellings and septic tank absorption fields because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because the soil is adequately protected from flooding. The brief periods of flooding can delay planting or damage crops in some years. The high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium. Applying increased amounts of phosphorus and potassium helps to overcome this limitation. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 land capability classification is IIw.

8201—Gilford loam, occasionally flooded. This nearly level, poorly drained soil is on outwash plains. It is occasionally flooded and ponded for brief periods from March through June. 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 also is black, friable loam. It is about 3 inches thick. The subsoil is mottled, friable and very friable fine sandy loam about 20 inches thick. The upper part is grayish brown. The lower part is light brownish gray. The substratum to a depth of 60 inches or more is very pale brown, loose fine sand. In some areas the subsoil contains more clay. In other areas the substratum contains more clay.

Included with this soil in mapping are small areas of Canisteo and Pella soils. Canisteo soils are calcareous throughout. They are in landscape positions similar to those of the Gilford soil or are in the slightly higher areas. Pella soils have more clay throughout than the Gilford soil. They are in landscape positions similar to those of the Gilford soil or are in the slightly lower areas. Also included, in depressions below the Gilford soil, are soils that are ponded for long periods. Included soils 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 lower part at a rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during the spring. The available water capacity is moderate. Organic matter content also is moderate. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It is unsuited to dwellings and septic tank absorption fields because of the flooding and the ponding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed and the soil is adequately protected from flooding. The seasonal high water table and the flooding can delay planting in some years. Soil blowing is a hazard, and the moderate available water capacity is a limitation. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. A conservation tillage system that leaves crop residue on the surface after planting helps to control soil blowing and conserves moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

The land capability classification is IIw.

8292—Wallkill silt loam, occasionally flooded. This nearly level, very poorly drained soil is on outwash plains. It is occasionally flooded and ponded for brief periods from March through June. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black, friable mucky silt loam about 16 inches thick. It is calcareous in the lower part. The substratum extends to a buried soil at a depth of about 32 inches. It is dark gray, friable, calcareous coprogenous earth. The upper part of the buried soil is black, mottled, friable mucky silt loam. The lower part to a depth of 60 inches or more is black, mottled, friable, calcareous organic material. In some areas the soil is mineral throughout and contains more sand. In other areas it contains organic material throughout.

Included with this soil in mapping are small areas of Aurelius and Edwards soils. These soils have organic material throughout and have marl in the lower part. Also included are a few small areas of soils that are calcareous in the surface layer. Included soils are in landscape positions similar to those of the Wallkill soil. They make up 3 to 5 percent of the unit.

Water and air move through the upper part of the Wallkill soil at a moderate rate and through the lower part at a moderately rapid or rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during the spring. The available water capacity is very high. Organic matter content is high. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are cultivated. This soil is moderately suited to cultivated crops. It is poorly suited to woodland. It is unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed and the soil is adequately protected from flooding. The seasonal high water table and the flooding can delay planting in some years. Measures that maintain or improve the drainage system may be needed. Surface drains can function satisfactorily if suitable outlets are available. Subsurface drains are subject to the damage caused by subsidence. Installing the drains with long sections of perforated tubing help to prevent this damage. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

In areas used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns because of the seasonal high water table. Plant competition also is a management concern. The use of equipment is limited to periods when the soil is firm. Planting mature nursery stock on prepared ridges reduces the seedling mortality rate. A harvesting method that does not isolate the remaining trees or leave them widely spaced reduces the hazard of windthrow. Removing only high-value trees from a strip 50 feet wide along the west and south edges of the woodland also reduces this hazard. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 land capability classification is IIIw.

8304—Landes silt loam, occasionally flooded. This nearly level, moderately well drained soil is on natural levees, low stream terraces, and flood plains. It is occasionally flooded for brief periods from March through June. Individual areas are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable, calcareous silt loam about 11 inches thick. The subsoil is about 24 inches thick. It is dark brown, friable and very friable, and calcareous. The upper part is loam. The next part is fine sandy loam. The lower part is loamy fine sand. The substratum to a depth of 60 inches or more is dark brown and calcareous. The upper part is very friable loamy fine sand. The lower part is loose fine sand. In some areas the subsoil contains more clay. In other areas the soil is only rarely flooded. In places the surface layer is thinner.

Included with this soil in mapping are small areas of soils that have gravelly material within a depth of 20 inches. These soils are in landscape positions similar to those of the Landes soil. They make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Landes soil at a moderately rapid rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow. The seasonal high water table is 4 to 6 feet below the surface during the spring. The available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to woodland, cultivated crops, hay, and pasture. It is unsuited to septic tank absorption fields and dwellings because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because the soil is adequately protected from flooding. The brief periods of flooding can delay planting in some years. Soil blowing is a hazard, and the moderate available water capacity is a limitation. A conservation tillage system that leaves crop residue on the surface after planting helps to control soil blowing and conserves moisture. Winter cover crops and field windbreaks help to control soil blowing. Because of the limited available water capacity, irrigation may be advantageous.

The main management concern in areas used as woodland is plant competition, which restricts the growth of desirable seedlings. The competition from undesirable vegetation in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland prevents 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 land capability classification is IIw.

8447—Canisteo loam, sandy substratum, occasionally flooded. This nearly level, poorly drained soil is on outwash plains. It is occasionally flooded and ponded for brief periods from March through June. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is black, friable, calcareous loam about 8 inches thick. The subsurface layer is very dark grayish brown, mottled, friable, calcareous loam about 6 inches thick. The subsoil is about 35 inches thick. It is mottled, friable, and calcareous. The upper part is dark grayish brown loam. The next part is olive gray silt loam. The lower part is dark grayish brown loam. The substratum to a depth of 60 inches or more is pale brown, mottled, loose, calcareous fine sand. In some areas the soil contains less sand throughout. In other areas it is deeper to calcareous material. In places, the subsoil contains less clay and the soil is deeper to calcareous material.

Included with this soil in mapping are small areas of the very poorly drained Aurelius soils. These soils have an organic surface layer. They are in landscape positions similar to those of the Canisteo soil or are in the slightly lower areas. Also included are soils that are sandy within a depth of 40 inches. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Canisteo soil at a moderate rate and through the lower part at a rapid rate. In cultivated areas surface runoff is slow to ponded. The seasonal high water table is within a depth of 1 foot during the spring. The available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops. It is unsuited to dwellings and septic tank absorption fields because of the flooding.

Corn, soybeans, and small grain can be grown in most areas because a drainage system has been installed and the soil is adequately protected from flooding. The seasonal high water table and the flooding can delay planting in some years. Measures that maintain or improve the drainage system may be needed. Subsurface drains can function satisfactorily if suitable outlets are available. Ditches also help to remove excess water. Enclosing subsurface drains with filtering material can keep sand from clogging tile lines. A high content of lime in the soil is a limitation. It reduces the availability of phosphorus and potassium and the effectiveness of herbicides. Applying increased amounts of phosphorus and potassium helps to overcome nutrient imbalances. Adjusting the rate of herbicide application can help to compensate for the high pH. Keeping tillage at a minimum and incorporating crop residue into the surface layer help to maintain tilth and fertility.

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.

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. 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 Bureau 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 for 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 Bureau 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 avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and 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 recreation facilities; and for wildlife habitat. It can be used to identify the 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 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

Alan M. Madison, district conservationist, Soil Conservation Service, helped prepare this section.

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

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

The primary crops in the county are corn and soybeans. Small grain and forage crops also are grown. In 1982, corn was grown on 296,469 acres and soybeans on about 114,100 acres *(13)*. A total of 12,273 acres was used as pasture, and 8,580 acres was used as hayland. The total acreage of cropland has increased slightly over the past 10 years. Presently, Bureau County has about 12,000 acres of marginal cropland in land capability subclasses IVe and VIe. This land would benefit from the conversion of cropland to pasture or woodland.

If managed properly, the soils in Bureau County have good potential for increased crop production. Over the years, technology has hidden the effects of erosion. There will come a time, however, when erosion will deplete the inherent productivity of the topsoil unless timely erosion-control measures are applied. This soil survey can be used as a guide to the latest management techniques that increase food and fiber production. It provides resource data for wise land use planning.

Erosion is the major management concern on about 40 percent of the cropland and pasture in Bureau County. It is a hazard on soils that have a slope of more than 2 percent. It is more severe on the steeper soils on longer slopes.

Loss of the surface layer, or sheet erosion, is damaging for three reasons. First, the organic matter content and natural fertility level are lowered as the surface layer is lost and part of the subsoil is incorporated into the plow layer. As a result, soil productivity is reduced. Second, severe erosion on sloping soils results in deterioration of tilth in the surface soil and reduces the rate of water intake. The heavier textured soils tend to become cloddy if worked when wet and tend to crust after hard rains. Because of the cloddiness, preparing a good seedbed is difficult. The surface crust increases the runoff rate. Third, erosion on farmland results in the sedimentation of streams, rivers, ponds, and road ditches. Erosion control helps to prevent this pollution and improves the quality of water available for municipal and recreational uses and for fish and wildlife.

A good management system maintains or improves natural fertility, helps to control erosion and soil blowing, removes excess water, and maintains good tilth. An adequate vegetative cover and measures that reduce the length of slopes help to control erosion and soil blowing, reduce the rate of runoff, and increase the rate of water intake. Soil losses can be held within tolerable limits and productivity maintained by a cropping system that keeps a plant cover and crop residue on the surface during periods of critical rainfall. A crop rotation that includes grasses and legumes improves tilth and increases the supply of nitrogen. A conservation tillage system, such as chisel plowing, no-till planting, and ridge-till planting, helps to prevent excess soil loss, reduces the runoff rate, and increases the rate of water infiltration (fig. 9). Conservation tillage is becoming more common in the areas in Bureau County used for row crops. It is effective in controlling erosion on most of the soils in the county.

Contour farming, contour stripcropping, terraces, and diversions help to control erosion and reduce the rate of runoff. They are most effective on soils that have uniform, regular slopes, such as Tama, Port Byron, Catlin, and Saybrook soils. On soils that have short, irregular slopes, such as on Parr, Varna, La Rose, Dodge, Miami, and Birkbeck soils, crop rotations that include grasses and legumes and a system of conservation tillage that leaves crop residue on the surface after planting are needed to control erosion.

Grassed waterways help to carry excess rainwater safely downslope to the nearest creek, stream, or other watercourse. When established in natural drainageways, they remove the water at a nonerosive velocity (fig. 10). They generally are used in conjunction with other conservation practices, such as terraces, diversions, conservation tillage systems, and contour farming. These conservation practices help to manage excess rainfall effectively, increase the available water capacity, and help to prevent excessive soil loss on cropland and in other areas. Grassed waterways are most effective in areas where the slope is 2 percent or more.

Crop rotations that include oats, wheat, or other small grain and hay are needed to control erosion in sloping to steep areas, such as many areas of Miami, La Rose, and Varna soils. They not only help to prevent excessive soil losses but also increase the content of organic matter and nitrogen in the soil, increase the available water capacity, and improve tilth. The number of crop-damaging weeds and insects in the soil can be reduced by crop rotations because of the annually changing soil environment.

Soil blowing is a problem on about 10 percent of the cropland. Examples of sandy soils that are susceptible to soil blowing are Dickinson, Oakville, and Sparta soils. Field windbreaks, a conservation tillage system that leaves crop residue on the surface after planting, and an adequate plant cover help to control soil blowing and prevent the damage caused by windblown soil particles.

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

Wetness is a limitation in the somewhat poorly drained and poorly drained soils in Bureau County. If the poorly drained soils are used for the crops commmonly grown in the county, some kind of drainage system is needed. One has been installed in most of these soils in the county. Additional drainage systems can improve crop production in some areas. Examples of poorly drained soils are Drummer, Harpster, Pella, Sable, and Selma soils. The wetness of the somewhat poorly drained soils can delay planting and thus reduce yields in some years. Drainage systems have been installed in most areas of these soils. Examples of somewhat poorly drained soils are Brenton, Elburn, Muscatine, and Flanagan soils.

Seepy spots are common in areas of the moderately well drained Assumption soils on side slopes, especially in wet years. Also, small areas of wetter soils along drainageways are included with the Assumption soils in mapping. A drainage system is needed in these areas.

The design of surface and subsurface drainage systems varies with the kind of soil. Tile drains alone are inadequate in many areas. A combination of open drainage ditches and tile drains is needed in some areas of poorly drained soils, such as Drummer, Harpster, Sable, and Selma soils. Tile drains are not effective in slowly permeable soils, such as Thorp soils. Moderately permeable soils, such as Drummer and Sable soils, can be adequately drained by tile drains if suitable outlets are available. Surface drains and surface inlets may be needed on these soils.

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

Droughtiness limits the productivity of some of the

Figure 9.—No-till corn planted into soybean residue in an area of Rozetta silt loam, 2 to 5 percent slopes.

soils used for crops and pasture in the county. The physical composition of some soils limits the amount of available water needed for the optimum growth of plants during dry periods. Dickinson and Sparta soils are examples. Droughtiness can be minimized by increasing the rate of water infiltration, reducing the runoff rate, and planting crops that are drought tolerant. No-till planting and crop residue management increase the rate of water infiltration, reduce the runoff rate, and reduce the amount of surface moisture lost through evaporation.

Natural fertility in the soils in Bureau County ranges from low to very high. It is low, for example, in Hickory and Oakville soils and very high in Muscatine, Elburn, and Sable soils. On most of the soils in the county, crops respond well to additions of nitrogen, phosphorus, and potassium fertilizer and of certain micronutrients. The soils are acid to calcareous. On the acid Fayette and Hickory soils, applications of ground limestone are needed to raise the pH level sufficiently for good crop production. On the calcareous Canisteo and Harpster soils, however, applications of lime are not needed because the pH level is naturally high. On all soils the kind and amount of lime and fertilizer to be applied should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The Cooperative Extension Service and the Soil Conservation Service can help in determining the kind and amount needed.

Soil tilth is an important factor affecting the germination of seeds, the runoff rate, and the rate of water infiltration. It is good in soils that are granular and porous.

Most of the soils used for crops in the county have a surface layer of loam, silt loam, or silty clay loam. Some of the soils have a lower content of organic matter than others. Generally, the structure of such soils is weak, and a crust forms on the surface during periods of intensive rainfall. The crust is hard when dry and is nearly impervious to water. It decreases the infiltration rate and increases the runoff rate. Regular additions of crop residue, manure, and other organic material improve soil structure and reduce the likelihood of crusting.

Poor tilth is a problem in the poorly drained Drummer, Sable, Pella, and Harpster soils. Clods form if these soils are tilled when wet. As a result of the cloddiness, preparing a good seedbed is difficult. The opportunity for primary tillage commonly is limited because these soils often stay wet until late in spring. If

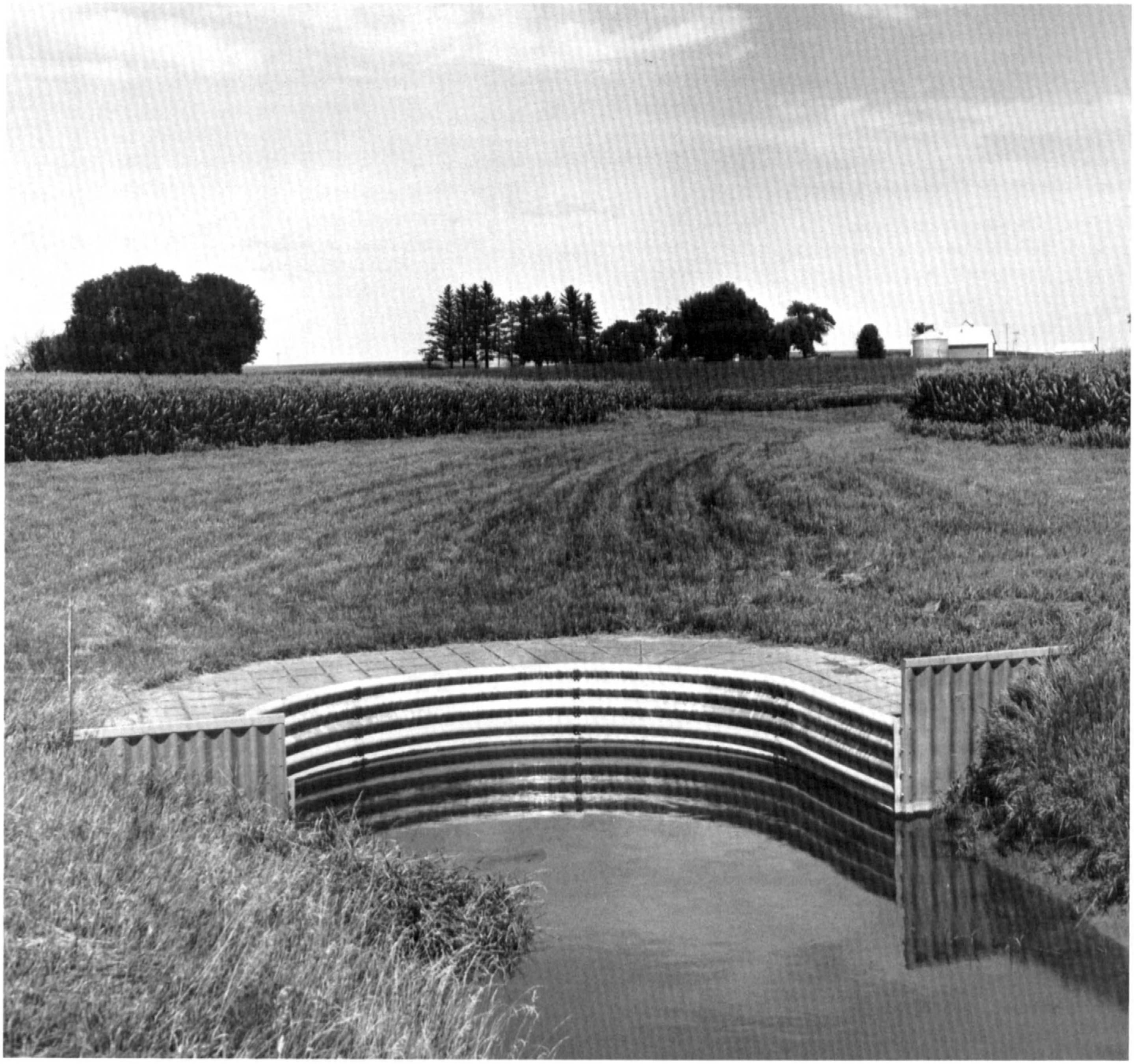


Figure 10.—A newly established grassed waterway and a grade-stabilization structure, both of which are used for the safe removal of water from an area of Otter silt loam.

the soils are tilled in the fall, enough crop residue should be left on the surface to prevent excessive soil blowing.

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 and measures that prevent overgrazing help to keep the stand productive. Seeding and maintaining legumes, such as alfalfa, red clover, and birdsfoot trefoil, in the stand of grasses improve the quality and productivity of the pasture and provide nitrogen for the grasses.

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 of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents *(4)*. 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 *(10)*. 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 and 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

William Ebert, soil scientist, Bureau County, helped prepare this section.

When Bureau County was first settled, the major river valleys, the bluffs above them, and many of the uplands near the major streams were forested. This forested land accounted for approximately 20 percent of the total land area in the county. Most of this upland forest supported oak and hickory. The bottom land species included cottonwood, sycamore, and maple. Since settlement, most of the upland forest and many areas of the bottom land forest have been cleared and converted to cropland or pasture. As a result, only 24,330 acres, or about 4 percent of the total land area in the county, is forested *(12)*. Most of the wooded areas are in associations 2, 3, 6, and 10, which are described under the heading "General Soil Map Units."

Management of the existing woodland can improve not only commercial timber production but also wildlife habitat. Measures that improve wildlife habitat include protecting the woodland from grazing; establishing shrub borders along wooded areas; culling all old and diseased trees, except for oak, to open up the canopy and encourage understory regrowth; and planting trees, such as oak, hickory, maple, and honeylocust. Measures that improve commercial timber production include harvesting mature and cull trees that retard the growth of desirable species and preventing both fires and grazing of the woodland by livestock. If stocking is inadequate, tree planting is needed. Measures that control plant competition may be needed. A grass cover between rows of seedlings helps to control erosion in the more sloping bare areas. If erosion is excessive or slopes are more than 15 percent, runoff should be diverted away from haul roads and skid trails.

Presently, Bureau County has about 12,000 acres of marginal cropland and highly erosive land that might be better used as woodland *(12)*. The Illinois Department of Conservation, the Cooperative Extension Service, the Soil Conservation Service, and the Bureau County Soil and Water Conservation District can provide assistance in planning woodland management.

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*, excessive 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*, high content of rock fragments in the soil; and *L*, low strength. 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 L.

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, fire lanes, and log-handling areas. Forests that have been burned or overgrazed also are 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 surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is 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 to give 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 is the dominant species on the soil and 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

Bureau County has a wide variety of recreation areas, including wetlands along the Illinois River and large sand dunes in the lowlands along the Green River. Private recreation facilities include a shooting preserve 1,000 acres in size, 1,380 acres of dominantly private fishing waters, several hunting clubs along the Illinois River, and five golf courses. Areas that are available to the public include 4 miles of hiking trails, 572 acres of campgrounds and picnic areas, extensive natural scenic areas, and many historic sites, such as the Red Covered Bridge, which is north of Princeton. Also available are several parks; areas of native prairie, such as the McCune Sand Prairie, the Center Prairie Project, and the Indian Boundary Line Prairie; the Hennepin Canal Parkway; Miller-Anderson Woods; and several wildlife refuges, including a large area south of Depue that is owned by the Illinois Department of Conservation.

The Illinois River, which forms part of the eastern boundary of the county, offers opportunities for a wide variety of recreational activities. These activities include boating, waterskiing, fishing, and waterfowl hunting.

The potential for additional development of recreational facilities in Bureau County is excellent. The strip-mined areas near Sheffield and Neponset and areas along the Illinois-Mississippi Canal have the best potential.

In table 9, the soils of the survey area are rated 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 also are important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 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

William Ebert and Gary Pomeranke, soil scientists, Bureau County, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 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 flood hazard. Soil temperature and soil moisture also are 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, flood hazard, 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 flood hazard. Soil temperature and soil moisture also are 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 hardwoods 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.

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.

In the following paragraphs, the associations described in the section "General Soil Map Units" are grouped into five wildlife areas.

Wildlife area 1 consists of the Selma, Drummer-Harpster-Selma, Waukegan-Sparta-Orio, and Houghton-Aurelius-Lena associations. The major soils in these associations are nearly level to strongly sloping and are very poorly drained, poorly drained, well drained, or excessively drained. This area provides the best natural wildlife habitat in the county because many small areas are marginal for crop production. These areas cannot be intensively cropped because of wetness or droughtiness.

This area is used mainly as cropland, hayland, or pasture. The wide diversity of land types and land uses provides good habitat for a wide variety of wildlife. The major game species include ring-necked pheasant, bobwhite quail, white-tailed deer, fox squirrel, gray squirrel, mourning dove, Hungarian partridge, and cottontail rabbit. This area also is inhabited by ducks and geese; fox, raccoon, skunk, and other furbearers; and nongame birds and mammals.

The limiting factors affecting wildlife include a scarcity of cover, winter food, and nesting areas. The major management concern is preserving the existing wetlands and woodland, including hedges and brushy fencerows. Measures that can improve the habitat for wildlife include increasing the amount of crop residue by minimizing tillage, protecting pastures from overgrazing by livestock, leaving grassed waterways and ditches unmowed until after the nesting season (August 1), protecting the woodland from fire, and setting aside small areas of marginal cropland that can be used as areas for cover and winter food production. The plant species that can be grown for winter food in these small areas include wheat, barley, oats, rye, soybeans, corn, lespedeza, grain sorghum, vetch, clover, alfalfa, or any combination of these.

Wildlife area 2 consists of the Saybrook-Parr-La Rose and Tama-Elkhart-Port Byron associations. The major soils in these associations are nearly level to strongly sloping and are well drained or moderately well drained.

This area is used mainly as cropland or pasture. The potential for a wide variety of wildlife habitats is generally poor because of the lack of diversity among soil and land types. The potential for openland habitat, however, is good. The major game species include ring-necked pheasant, bobwhite quail, white-tailed deer, and mourning dove. This area is also inhabited by raccoon, skunk, meadowlark, and other species adapted to openland habitat.

Measures that can improve the habitat for wildlife include increasing the amount of crop resiudue by minimizing tillage, protecting pastures from overgrazing by livestock, leaving grassed waterways and ditches unmowed until after the nesting season (August 1), protecting the existing woodland and grassy cover, maintaining brushy fencerows and hedges, and setting aside small areas of sloping and eroded cropland that can be used for winter food production. The plant species that can be grown for winter food in these small areas include wheat, barley, oats, rye, soybeans, corn, big bluestem, grain sorghum, vetch, clover, alfalfa, or any combination of these.

Wildlife area 3 consists of the Tama-Muscatine-Sable, Plano-Elburn-Drummer, and Catlin-Sable associations. The major soils in these associations are nearly level to sloping and are poorly drained to well drained.

This area is used mainly as cropland. On much of the cropland, corn or soybeans are grown year after year. Many of the soils are fall plowed. The potential for wildlife habitat is relatively poor because of the lack of diversity in soil and land types and in land uses. The area generally provides poor habitat for wildlife because of a scarcity of crop residue, herbaceous nesting and roosting cover, woody cover, travel lanes, hedgerows, and winter food. The wildlife in this area include ring-necked pheasant, raccoon, small numbers of white-tailed deer, and nongame species, such as red-winged blackbird, grasshopper sparrow, meadowlark, ground squirrel, chipmunks, and other species adapted to openland habitat.

Measures that can improve the habitat for wildlife include leaving roadsides, ditches, and grassed waterways unmowed until after the nesting season (August 1), protecting the existing woody and grassy cover, increasing the amount of crop residue by minimizing tillage, maintaining brushy fencerows and hedges, and setting aside small areas of sloping and eroded cropland that can be used for cover and winter food production. The plant species that can be grown for winter food in these small areas include wheat, barley, oats, rye, soybeans, corn, grain sorghum, vetch, big bluestem, clover, alfalfa, or any combination of these.

Wildlife area 4 consists of the Rozetta-Fayette-Hennepin and Minneiska-Landes associations. The major soils in these associations are nearly level to very steep and are moderately well drained or well drained.

This area is used mainly as cropland, woodland, or pasture. The most extensive kind of habitat is woodland wildlife habitat. The potential for wildlife habitat is good because of some diversity in land types. The major wildlife species include white-tailed deer, cottontail rabbit, ring-necked pheasant, bobwhite quail, fox squirrel, gray squirrel, wild turkey, mourning dove, raccoon, and nongame birds and mammals.

The primary management concern in this area is preservation of the existing woodland. Measures that can improve the habitat for wildlife include protecting pasture from overgrazing; increasing the amount of crop residue by minimizing tillage; leaving grassed waterways and ditches unmowed until after the nesting season (August 1); allowing for new growth in wooded areas by culling all old and diseased trees, except for oak; reseeding and maintaining pastures; establishing shrub borders along wooded areas; and planting trees, including oak, hickory, walnut, sweetgum, maple, redcedar, and honeylocust. Another beneficial measure is setting aside small areas of marginal cropland that can be used for nesting cover and winter food production. The plant species that can be grown for winter food in these small areas include wheat, barley, rye, oats, soybeans, corn, grain sorghum, vetch, big bluestem, clover, alfalfa, or any combination of these.

Wildlife area 5 occurs as the Moundprairie association. The Moundprairie soils are nearly level and are poorly drained or very poorly drained.

This area is used mainly as woodland. Some areas are used as cropland or wildlife habitat. The potential for wildlife habitat is good because much of the area is marginal cropland that is not intensively cropped. The best potential is for wetland wildlife habitat because much of this area is flooded or ponded for extended periods, but the area also provides good habitat for woodland and openland species.

The major wetland species include various kinds of waterfowl, muskrats, heron, king fisher, red-winged blackbird, and other small birds and mammals. The major woodland species include white-tailed deer, raccoon, fox squirrel, woodcock, woodpeckers, cottontail rabbit, and other birds and mammals. The major openland species include bobwhite quail, ring-necked pheasant, cottontail rabbit, mourning dove, meadowlark, and other songbirds and mammals.

Because of the diversity of habitat in this area, a variety of management measures is needed. Measures that can improve the habitat for wetland wildlife include preserving the existing wetlands (fig. 11); protecting grassy areas from overgrazing by livestock; leaving ditches and grassed waterways unmowed until after the nesting season (August 1); providing food and nesting cover by planting water-tolerant plants, such as redtop, mannagrass, prairie cordgrass, and mint; and constructing nesting boxes for wood ducks along ponds and streams.

Different measures are required for woodland wildlife. The most important of these include protecting the existing woodland from fire and from overgrazing by livestock; allowing for new growth by culling all old and diseased trees, except for oak; reseeding and maintaining pastures; clearcutting small areas; establishing shrub borders along wooded areas; planting nut-bearing trees, including pin oak, red oak, bur oak, hickory, and walnut; and planting other trees, such as red maple, sweetgum, honeylocust, cottonwood, sycamore, and silver maple.

Measures that can improve the habitat for openland wildlife include leaving roadsides, ditches, and grassed waterways unmowed until after the nesting season (August 1), protecting the existing woody and grassy cover, increasing the amount of crop residue by minimizing tillage, maintaining brushy fencerows and hedges, and setting aside small areas of marginal cropland that can be used for cover and winter food production. The plant species that can be grown for winter food in these small areas include wheat, barley, oats, rye, soybeans, corn, grain sorghum, reed canarygrass, vetch, big bluestem, clover, alfalfa, or any combination of these.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations 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 kind of absorbed 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 recreation 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

Figure 11.—A backwater lake adjacent to the Illinois River. Siltation of the backwater lakes adjacent to the river can destroy the habitat for waterfowl. Moundprairie silt loam, wet, is in the wooded area in the background.

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, the shrink-swell potential, and organic layers can cause the movement of footings (fig. 12). 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. The 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 landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel 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

Figure 12.—Building site development in an area of Downs silt loam, 2 to 5 percent slopes. Properly designing and reinforcing the foundation and installing a subsurface drainage system around the foundation help to overcome the shrink-swell potential and the seasonal high water table.

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 needs to 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 type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during the wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 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 a 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 depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 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 as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 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 potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to help 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 soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 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 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 "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, and 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, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. 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 soil blowing 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 soil blowing 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 soil blowing 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 soil blowing 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 soil blowing 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 soil blowing 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 soil blowing are used.

8. Soils that are not subject to soil blowing 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

Figure 13.—Flooding in an area of Minneiska loam, occasionally flooded.

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 or by runoff from adjacent slopes (fig. 13). 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; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that is occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered 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 depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 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.

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 corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is 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 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(11)*. 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" *(9)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(11)*. 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."

Assumption Series

The Assumption series consists of moderately well drained soils on side slopes in the uplands. These soils formed in loess. They are underlain within a depth of 40 inches by a paleosol that formed in Illinoian till. Permeability is moderate in the upper part of the profile and moderately slow and slow in the lower part. Slope ranges from 10 to 15 percent.

The Assumption soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. Also, the paleosol is not part of the solum. These differences, however, do not significantly affect the use or behavior of the soils.

Assumption soils are similar to Catlin, Elkhart, Plano, Saybrook, Tama, and Waupecan soils. The similar soils do not have a paleosol within a depth of 60 inches. Catlin and Saybrook soils formed in loess and in Wisconsin glacial till. Plano and Waupecan soils formed in loess and glacial outwash.

Typical pedon of Assumption silty clay loam, 10 to 15 percent slopes, severely eroded, 320 feet west and 1,080 feet south of the northeast corner of sec. 22, T. 15 N., R. 6 E.

Ap—0 to 8 inches; mixed very dark gray (10YR 3/1) and dark yellowish brown (10YR 4/4) silty clay loam, grayish brown (10YR 5/2) and light yellowish brown (10YR 6/4) dry; moderate very fine subangular blocky structure; friable; common very fine roots; slightly acid; clear smooth boundary.

Bt1—8 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine and common very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—15 to 21 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common very fine roots; few distinct dark brown (10YR 4/3) clay films and few prominent light gray (10YR 7/2) silt coatings on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt3—21 to 29 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very fine roots; few distinct dark brown (10YR 4/3) clay films and few prominent light gray (10YR 7/2) silt coatings on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2C—29 to 36 inches; stratified light brownish gray (10YR 6/2) and dark brown (10YR 3/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common fine and medium soft accumulations of iron and manganese oxide; slight effervescence; mildly alkaline; gradual smooth boundary.

3Btgb1—36 to 44 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine roots; few faint dark brown (7.5YR 4/2) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; few till pebbles; neutral; clear smooth boundary.

3Btgb2—44 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few faint dark brown (7.5YR 4/2) clay films on faces of peds; common fine soft accumulations and common medium concretions of iron and manganese oxide; few till pebbles; neutral.

The thickness of the solum ranges from 48 to more than 60 inches, depending on the amount of geologic truncation prior to loess deposition. Depth to the paleosol ranges from 20 to 40 inches. The dark surface layer is 6 to 9 inches thick.

The Ap horizon has value of 3 or 4 and chroma of 1 to 4. It is commonly silty clay loam, but in some moderately eroded areas it is silt loam. The Bt horizon has value of 4 to 6 and chroma of 2 to 4. The 3Btgb horizon has hue of 2.5Y, 5Y, or 10YR, value of 4 or 5, and chroma of 2 or 3. It is clay loam or silty clay loam.

Atterberry Series

The Atterberry series consists of somewhat poorly drained, moderately permeable soils on loess-covered glacial till plains and stream terraces. These soils formed entirely in loess. Slope ranges from 0 to 2 percent.

Atterberry soils are similar to Downs, Muscatine, and Stronghurst soils. Downs soils are moderately well drained. Muscatine soils have a mollic epipedon. Stronghurst soils have a surface layer that is lighter colored than that of the Atterberry soils.

Typical pedon of Atterberry silt loam, 1,650 feet north and 1,120 feet east of the southwest corner of sec. 34, T. 16 N., R. 9 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—9 to 13 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/2) dry; common fine faint grayish brown (10YR 5/2) mottles; moderate thin platy structure; friable; few fine roots; slightly acid; clear smooth boundary.

EB—13 to 17 inches; brown (10YR 5/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium platy structure parting to moderate very fine subangular blocky; friable; few fine roots; common distinct dark brown (10YR 4/3) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt—17 to 24 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; many distinct dark grayish brown (10YR 4/2) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; common fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg1—24 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine faint light brownish gray (2.5Y 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct grayish brown (10YR 5/2) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; common fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg2—33 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct grayish brown (10YR 5/2) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; many distinct very dark grayish brown (10YR 3/2) clay films lining pores; common fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg3—40 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; friable; few fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; many distinct very dark grayish brown (10YR 3/2) clay films lining pores; strongly acid; clear smooth boundary.

BCg—48 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; friable; common distinct grayish brown (10YR 5/2) clay films on faces of peds; many distinct very dark grayish brown (10YR 3/2) clay films lining pores; medium acid.

The solum ranges from 42 to more than 60 inches in thickness. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 to 6. Some pedons do not have an EB horizon. The Bt horizon has value of 4 or 5. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3.

Aurelius Series

The Aurelius series consists of very poorly drained soils on outwash plains and lake plains. These soils formed in less than 16 inches of organic material and are underlain by marl and sandy material. Permeability is moderately slow to moderately rapid in the organic material, varies in the marl, and is rapid in the sandy material. Slope ranges from 0 to 2 percent.

The Aurelius soils in this county are taxadjuncts because they have slightly less calcium carbonate than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Aurelius soils are similar to Edwards and Lena soils. Edwards and Lena soils formed in organic material that is more than 16 inches thick.

Typical pedon of Aurelius muck, sandy substratum, 174 feet west and 186 feet north of the center of sec. 13, T. 18 N., R. 6 E.

Oap—0 to 10 inches; black (N 2/0) sapric material, black (10YR 2/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Cg1—10 to 17 inches; gray (10YR 5/1) marl; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; common fine light gray (10YR 7/2) seams of lime; violent effervescence; mildly alkaline; clear smooth boundary.

Cg2—17 to 25 inches; light brownish gray (2.5Y 6/2) marl; common medium prominent dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; violent effervescence; mildly alkaline; clear smooth boundary.

Cg3—25 to 50 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) marl; common medium distinct strong brown (7.5YR 5/6) mottles; massive; very friable; few fine roots; violent effervescence; mildly alkaline; clear smooth boundary.

2Cg4—50 to 60 inches; dark gray (N 4/0) loamy sand; single grain; loose; violent effervescence; mildly alkaline.

Depth to the sandy material ranges from 40 to 60 inches. The sapric surface layer ranges from 8 to 12 inches in thickness.

The Oap horizon has free carbonates in some pedons. Some pedons have an A horizon. This horizon has hue of 10YR or is neutral in hue. It has chroma of 0 or 1. The limnic material is primarily marl, but a few pedons have thin layers of coprogenous earth ranging from 1 to 9 inches in total thickness. The marl has value of 5 to 7. The 2Cg horizon is sand or loamy sand. It has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 6.

Ayr Series

The Ayr series consists of well drained soils on glacial moraines. These soils formed in sandy deposits over loamy glacial till. Permeability is rapid in the sandy material and moderate in the glacial till. Slope ranges from 5 to 10 percent.

The Ayr soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Ayr soils are similar to Dickinson soils. Dickinson soils formed entirely in sandy material.

Typical pedon of Ayr loamy fine sand, 5 to 10 percent slopes, eroded, 162 feet west and 2,360 feet north of the southeast corner of sec. 16, T. 18 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 19 inches; dark yellowish brown (10YR 4/4) fine sand; weak medium and fine subangular blocky structure; very friable; few fine roots; common faint brown (10YR 4/3) clay films bridging sand grains; slightly acid; clear smooth boundary.

Bt2—19 to 30 inches; yellowish brown (10YR 5/4) fine sand; weak medium subangular blocky structure; very friable; few fine roots; common faint dark yellowish brown (10YR 4/4) clay films bridging sand grains; slightly acid; abrupt smooth boundary.

2Bt3—30 to 39 inches; brown (7.5YR 5/4) clay loam; weak medium subangular blocky structure; friable; common distinct strong brown (7.5YR 4/6) clay films on faces of peds; about 5 percent pebbles; neutral; clear smooth boundary.

2C—39 to 60 inches; brown (7.5YR 5/4) loam; massive; friable; about 5 percent pebbles; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 32 to 40 inches and commonly corresponds to the depth to free carbonates. The depth to glacial till ranges from 24 to 36 inches.

The Ap horizon has value of 2 or 3. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. It is loamy sand, fine sand, or sand. The 2Bt horizon has hue of 10YR or 7.5YR and chroma of 4 to 6. It is clay loam or loam. The 2C horizon has hue of 10YR or 7.5YR.

Batavia Series

The Batavia series consists of well drained soils on outwash plains and stream terraces. These soils formed in 40 to 60 inches of loess and in stratified outwash. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 0 to 10 percent.

Batavia soils are similar to Catlin, Downs, Elkhart, Plano, and St. Charles soils. Catlin soils formed in loess and glacial till. Downs and Elkhart soils formed entirely in loess. Plano soils have a mollic epipedon. St. Charles soils have a surface layer that is lighter colored than that of the Batavia soils.

Typical pedon of Batavia silt loam, 0 to 2 percent slopes, 1,730 feet north and 670 feet east of the southwest corner of sec. 18, T. 16 N., R. 9 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—17 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—27 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—34 to 41 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) and few fine faint brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

2Bt5—41 to 48 inches; yellowish brown (10YR 5/4) loam; few fine faint yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

2Bt6—48 to 60 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of loamy sand; weak medium subangular blocky structure; very friable; few faint dark yellowish brown (10YR 4/4) clay films bridging sand grains; slightly acid.

The solum ranges from 42 to more than 60 inches in thickness. The Ap or A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has chroma of 3 or 4. It is silty clay loam or silt loam. The 2Bt horizon is stratified loam, silt loam, sandy loam, or loamy sand.

Birkbeck Series

The Birkbeck series consists of moderately well drained soils on glacial till plains and moraines. These soils formed in 40 to 60 inches of loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slope ranges from 2 to 15 percent.

Birkbeck soils are similar to Camden, Dodge, Fayette, Marseilles, Rozetta, St. Charles, and Sylvan soils. Camden and St. Charles soils formed in loess and glacial outwash. Dodge soils have a mantle of loess that is thinner than that of the Birkbeck soils. Fayette, Rozetta, and Sylvan soils formed entirely in loess. Marseilles soils formed in loess and material weathered from shale.

Typical pedon of Birkbeck silt loam, 2 to 5 percent slopes, 2,442 feet west and 792 feet north of the southeast corner of sec. 24, T. 16 N., R. 10 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—10 to 14 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—14 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt3—23 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) and common fine faint dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; common fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—32 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct light brownish gray (10YR 6/2) and common fine faint dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few distinct grayish brown (10YR 5/2) silt coatings on faces of peds; common fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt5—42 to 57 inches; dark yellowish brown (10YR 4/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and few fine distinct dark brown (7.5YR 4/4) mottles; weak medium prismatic structure; friable; common distinct dark yellowish brown (10YR 4/4) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; common fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

2Bt6—57 to 60 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; friable;

few distinct dark brown (10YR 4/3) clay films on faces of peds; medium acid.

The solum ranges from 50 to more than 60 inches in thickness. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an E horizon. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or loam. Some pedons have a 2C horizon, which is loam or clay loam.

Brenton Series

The Brenton series consists of somewhat poorly drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess or silty material and in the underlying loamy outwash. Slope ranges from 0 to 2 percent.

Brenton soils are similar to Elburn, Joy, Lisbon, and Muscatine soils. Elburn soils have a mantle of loess that is thicker than that of the Brenton soils. Joy soils are underlain by sandy material. Lisbon soils are not stratified in the lower part. Muscatine soils formed entirely in loess.

Typical pedon of Brenton silt loam, 582 feet east and 1,290 feet north of the southwest corner of sec. 34, T. 16 N., R. 8 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

A—8 to 12 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; slightly acid; clear smooth boundary.

AB—12 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; many black (10YR 2/1) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—18 to 22 inches; brown (10YR 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very dark grayish brown (10YR 3/2) organic coatings and common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 28 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—28 to 34 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common dark stains and concretions of iron and manganese oxide; medium acid; clear smooth boundary.

2Bt4—34 to 43 inches; dark yellowish brown (10YR 4/4), stratified sandy loam, loam, and silt loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; common dark stains and concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

2C—43 to 60 inches; yellowish brown (10YR 5/6), stratified sandy loam and loamy sand; common medium distinct strong brown (7.5YR 5/6), few medium distinct pale brown (10YR 6/3), and common fine faint brownish yellow (10YR 6/6) mottles; massive; friable; common dark stains of iron and manganese oxide; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the loess ranges from 24 to 40 inches. The mollic epipedon ranges from 10 to 20 inches in thickness.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bt horizon has chroma of 2 to 4. The 2Bt horizon has value of 4 to 7 and chroma of 1 to 8. It is stratified loam, clay loam, sandy loam, or silt loam. It has carbonates below a depth of 40 inches in some pedons. The 2C horizon has textures similar to those of the 2Bt horizon but commonly has thin strata of loamy sand.

Camden Series

The Camden series consists of well drained soils on outwash plains and stream terraces. These soils formed in 24 to 40 inches of loess and in the underlying glacial outwash. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 0 to 10 percent.

Camden soils are similar to Birkbeck, Dodge, Fayette, Marseilles, Martinsville, Rozetta, St. Charles, and Sylvan soils. Birkbeck and Dodge soils formed in loess and glacial till. Fayette, Rozetta, and Sylvan soils formed entirely in loess. Marseilles soils formed in loess and material weathered from shale. Martinsville soils are fine-loamy. They formed in a mantle of loess that is shallower over glacial outwash than that of the Camden soils. St. Charles soils formed in 40 to 60 inches of loess and in the underlying glacial outwash.

Typical pedon of Camden silt loam, 0 to 2 percent slopes, 1,280 feet west and 1,740 feet south of the northeast corner of sec. 12, T. 15 N., R. 8 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

E—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to weak fine subangular blocky; friable; few fine roots; neutral; clear smooth boundary.

Bt1—12 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt3—26 to 34 inches; yellowish brown (10YR 5/6) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt4—34 to 37 inches; strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; friable; few fine roots; many distinct brown (7.5YR 4/4) clay films on faces of peds; about 7 percent gravel; slightly acid; clear smooth boundary.

2Bt5—37 to 48 inches; strong brown (7.5YR 5/6) sandy clay loam; 1-inch strata of yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; common distinct brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; slightly acid; clear smooth boundary.

2Bt6—48 to 53 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; common distinct brown (7.5YR 4/4) clay films bridging sand grains; about 2 percent gravel; neutral; clear wavy boundary.

2C—53 to 60 inches; brown (7.5YR 4/4) sandy loam that has thin strata of loamy sand; loose; single grain; about 5 percent gravel; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the loess ranges from 24 to 40 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 2 to 4. Eroded pedons do not have an E horizon. The Bt horizon has value of 4 or 5 and chroma of 4 to 6. The 2Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is loam, clay loam, or sandy clay loam in the upper part and sandy loam, sandy clay loam, loam, or silt loam in the lower part.

Canisteo Series

The Canisteo series consists of poorly drained soils on outwash plains or in depressions on moraines. These soils formed in calcareous, loamy sediments underlain by sandy outwash or loamy glacial till. Permeability is moderate in the loamy material and rapid in the sandy material. Slope ranges from 0 to 2 percent.

Canisteo soils are similar to Harpster and Prophetstown soils. Harpster and Prophetstown soils have a lower content of sand than the Canisteo soils.

Typical pedon of Canisteo loam, sandy substratum, 1,940 feet west and 470 feet south of the northeast corner of sec. 18, T. 17 N., R. 6 E.

Akp—0 to 7 inches; black (N 2/0) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common fine roots; violent effervescence; mildly alkaline; abrupt smooth boundary.

Ak—7 to 12 inches; black (N 2/0) loam, black (10YR 2/1) dry; moderate medium granular structure; friable; few fine roots; violent effervescence; mildly alkaline; clear smooth boundary.

A—12 to 17 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure parting to moderate medium granular; friable; few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

BA—17 to 22 inches; very dark grayish brown (2.5Y 3/2) loam, dark grayish brown (2.5Y 4/2) dry; few fine prominent yellowish brown (10YR 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; moderate fine subangular blocky structure; friable; few fine roots; common black (10YR 2/1) organic coatings on faces of peds; black (10YR 2/1) loamy krotovinas and light brownish gray (10YR 6/2) sandy krotovinas; slight effervescence; mildly alkaline; clear smooth boundary.

Bg1—22 to 30 inches; dark grayish brown (2.5Y 4/2) loam; common fine prominent strong brown (7.5YR 5/6) and few fine faint grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; common very dark gray (10YR 3/1) organic coatings on faces of peds; very dark grayish brown (2.5Y 3/2) loamy krotovinas and light brownish gray (10YR 6/2) sandy krotovinas; slight effervescence; mildly alkaline; clear smooth boundary.

Bg2—30 to 38 inches; olive gray (5Y 5/2) loam; common fine prominent strong brown (7.5YR 5/6) and few fine distinct gray (5Y 6/1) mottles; moderate medium subangular blocky structure; friable; few fine roots; common dark gray (5Y 4/1) organic coatings on faces of peds; very dark grayish brown (2.5Y 3/2) loamy krotovinas; strong effervescence; mildly alkaline; clear smooth boundary.

BCg—38 to 44 inches; dark grayish brown (2.5Y 4/2) sandy loam; few fine distinct strong brown (7.5YR 5/6) and gray (5Y 5/1) mottles; weak medium subangular blocky structure; friable; few fine roots; common dark gray (5Y 4/1) organic coatings on faces of peds; black (10YR 2/1) loamy krotovinas; slight effervescence; mildly alkaline; clear smooth boundary.

2Cg—44 to 60 inches; very dark gray (5Y 3/1) and grayish brown (2.5Y 5/2) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; few fine roots; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 28 to 50 inches. The mollic epipedon ranges from 14 to 24 inches in thickness.

The Akp, Ak, and A horizons have value of 2 or 3. They are loam or silt loam. The Bg horizon has chroma of 1 or 2. It is dominantly loam, silt loam, or sandy loam, but subhorizons of loamy sand as much as 5 inches thick are in some pedons. The 2Cg horizon is fine sand, sand, or loamy sand in the sandy substratum phases. The Cg horizon is loam in pedons not underlain by sandy material.

Casco Series

The Casco series consists of somewhat excessively drained soils on dissected stream terraces, outwash plains, and till plains. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope ranges from 12 to 60 percent.

Casco soils are similar to Rodman soils. Rodman soils have a mollic epipedon and do not have an argillic horizon. They have more gravel in the upper part than the Casco soils.

Typical pedon of Casco silt loam, in an area of Hennepin-Casco complex, 25 to 60 percent slopes, 2,400 feet south and 2,010 feet east of the northwest corner of sec. 28, T. 17 N., R. 9 E.

A—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt—7 to 15 inches; brown (10YR 4/3) gravelly loam; moderate medium granular structure; friable; few fine roots; common distinct dark brown (10YR 3/3) clay films on faces of peds; about 30 percent gravel; slight effervescence; mildly alkaline; clear smooth boundary.

C1—15 to 31 inches; dark yellowish brown (10YR 4/4), stratified sand and gravel; single grain; loose; about 40 percent gravel when mixed; violent effervescence; mildly alkaline; clear smooth boundary.

C2—31 to 60 inches; yellowish brown (10YR 5/4), stratified sand and gravel; single grain; loose; about 60 percent gravel when mixed; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 10 to 24 inches. The Bt horizon has hue of 10YR or 7.5YR and value and chroma of 3 or 4. It is loam, gravelly loam, gravelly clay loam, or gravelly sandy clay loam.

Catlin Series

The Catlin series consists of moderately well drained, moderately permeable soils on loess-covered moraines. These soils formed in 40 to 60 inches of loess and in the underlying loamy glacial till. Slope ranges from 2 to 10 percent.

The Catlin soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Catlin soils are similar to Assumption, Batavia, Downs, Elkhart, Plano, Saybrook, Tama, and Waupecan soils. Assumption soils have a paleosol within a depth of 60 inches. Batavia, Plano, and Waupecan soils formed in loess and glacial outwash. Downs, Elkhart, and Tama soils formed entirely in loess. Saybrook soils formed in less than 40 inches of loess and in the glacial till.

Typical pedon of Catlin silt loam, 2 to 5 percent slopes, eroded, 385 feet north and 215 feet east of the southwest corner of sec. 8, T. 16 N., R. 11 E.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common very fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—16 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; common medium soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—24 to 34 inches; dark yellowish brown (10YR 4/4) silty clay loam; many fine distinct strong brown (7.5YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few very fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; common medium soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt4—34 to 43 inches; brown (10YR 5/3) silt loam; many fine distinct strong brown (7.5YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; common medium soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2Bt5—43 to 47 inches; brown (7.5YR 5/4) loam; common medium faint strong brown (7.5YR 5/6) and few fine distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; few very fine roots; few faint dark brown (7.5YR 4/4) clay films on faces of peds; few fine accumulations of iron and manganese oxide; mildly alkaline; clear smooth boundary.

2C—47 to 60 inches; brown (7.5YR 5/4) loam; common medium faint strong brown (7.5YR 5/6) and few fine distinct brown (10YR 5/3) mottles; massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to 55 inches. The Ap horizon has chroma of 1 to 3. The Bt horizon has chroma of 3 to 6. The 2Bt horizon is clay loam, loam, or silt loam. The 2C horizon has hue of 7.5YR or 10YR. It is loam, clay loam, or silty clay loam.

Chatsworth Series

The Chatsworth series consists of moderately well drained, very slowly permeable soils in the uplands. These soils formed in silty clay loam glacial till. Slope ranges from 30 to 50 percent.

Chatsworth soils are similar to Hennepin soils. Hennepin soils formed in loam glacial till.

Typical pedon of Chatsworth silt loam, 30 to 50 percent slopes, 1,860 feet north and 910 feet west of the southeast corner of sec. 27, T. 16 N., R. 10 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; few pebbles; weak effervescence; mildly alkaline; abrupt smooth boundary.

Bw1—4 to 10 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; firm; common fine and few coarse roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few pebbles; weak effervescence; mildly alkaline; clear smooth boundary.

Bw2—10 to 15 inches; brown (10YR 5/3) silty clay loam; weak medium angular blocky structure; common distinct dark grayish brown (10YR 4/2) coatings on faces of peds; firm; few fine and few coarse roots between peds; few pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

C—15 to 60 inches; brown (10YR 5/3) silty clay loam; common vertical cleavage planes or medium prismatic structure; firm; few distinct dark grayish brown (10YR 4/2) coatings on faces of peds in the upper part; few fine white soft accumulations of calcium carbonate; few pebbles; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 24 inches. Free carbonates are within a depth of 20 inches.

The A horizon has value of 3 or 4 and chroma of 1 or 2. The Bw horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silty clay loam but in some pedons has subhorizons of silty clay or clay.

Chute Series

The Chute series consists of excessively drained, rapidly permeable soils on outwash plains. These soils formed in sandy eolian material. Slope ranges from 7 to 20 percent.

Chute soils are similar to Oakville and Sparta soils. Oakville and Sparta soils are more acid than the Chute soils. They do not have carbonates within a depth of 40 inches.

Typical pedon of Chute fine sand, 7 to 20 percent slopes, severely eroded, 380 feet north and 2,000 feet west of the southeast corner of sec. 17, T. 17 N., R. 6 E.

A—0 to 4 inches; brown (10YR 5/3) fine sand, light yellowish brown (10YR 6/4) dry; weak coarse subangular blocky structure; very friable; few fine roots; strong effervescence; mildly alkaline; gradual smooth boundary.

C—4 to 60 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 0 to nearly 6 inches. It corresponds to the thickness of the A horizon. This A horizon has value of 4 or 5. The C horizon is fine sand or sand.

Dickinson Series

The Dickinson series consists of somewhat excessively drained soils on dunes on 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. Slope ranges from 0 to 15 percent.

Dickinson soils are similar to Chute and Sparta soils. Chute soils do not have a mollic epipedon. They have carbonates within a depth of 16 inches. Sparta soils have a higher content of sand in the upper part than the Dickinson soils.

Typical pedon of Dickinson sandy loam, 0 to 2 percent slopes, 360 feet north and 1,720 feet west of the center of sec. 17, T. 17 N., R. 6 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; few fine roots; medium acid; abrupt smooth boundary.

A1—8 to 15 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; few fine roots; medium acid; clear smooth boundary.

A2—15 to 20 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; few fine roots; common very dark brown (10YR 2/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

BA—20 to 31 inches; dark brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; few fine roots; dark brown (10YR 3/3) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt—31 to 36 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; common distinct brown (10YR 4/3) clay films bridging sand grains; slightly acid; clear smooth boundary.

BC—36 to 47 inches; yellowish brown (10YR 5/6) sand; weak coarse prismatic structure; very friable; medium acid; clear smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; strong brown (7.5YR 5/6) bands ½ inch to 2 inches thick at depths of 52, 56, and 58 inches; medium acid.

The thickness of the solum ranges from 30 to 50 inches. The mollic epipedon ranges from 10 to 22 inches in thickness.

The A horizon has value and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. Some pedons do not have a BC horizon. Some do not have high-chroma iron bands in the C horizon.

Dickinson sandy loam, 2 to 7 percent slopes, eroded, and Dickinson sandy loam, 7 to 15 percent slopes, eroded, are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Dodge Series

The Dodge series consists of well drained, moderately permeable soils in the uplands. These soils formed in 24 to 36 inches of loess and in the underlying loamy glacial till. Slope ranges from 2 to 15 percent.

Dodge soils are similar to Birkbeck, Camden, Fayette, Marseilles, Miami, Rozetta, St. Charles, and Sylvan soils. Birkbeck soils have a mantle of loess that is deeper over glacial till than that of the Dodge soils. Camden and St. Charles soils formed in loess and glacial outwash. Fayette, Rozetta, and Sylvan soils formed entirely in loess. Marseilles soils formed in loess and material weathered from shale. Miami soils have a mantle of loess that is thinner than that of the Dodge soils. They formed mainly in glacial till.

Typical pedon of Dodge silt loam, 10 to 15 percent slopes, eroded, 620 feet south and 1,020 feet west of the northeast corner of sec. 22, T. 15 N., R. 8 E.

Ap—0 to 8 inches; mixed brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/4) silt loam, moderate fine subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and few very pale brown (10YR 7/4) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt2—15 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium and fine subangular blocky structure; firm; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few very pale brown (10YR 7/4) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—20 to 31 inches; yellowish brown (10YR 5/6) silt loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few pale brown (10YR 7/4) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

2Bt4—31 to 38 inches; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; firm; few fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; few small pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

2C—38 to 60 inches; brown (7.5YR 5/4) loam; massive; firm; few fine roots; few small pebbles; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 40 inches. The thickness of the loess ranges from 24 to 36 inches.

The Bt horizon has chroma of 3 to 6. The 2Bt and 2C horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

Downs Series

The Downs series consists of moderately well drained, moderately permeable soils in the uplands. These soils formed in loess. Slope ranges from 0 to 10 percent.

Downs soils are similar to Atterberry, Batavia, Catlin, Fayette, Plano, Rozetta, and Tama soils. Atterberry soils are somewhat poorly drained. Batavia and Plano soils formed in loess and glacial outwash. Catlin soils formed in loess and glacial till. Fayette and Rozetta soils have an ochric epipedon. Tama soils have a mollic epipedon.

Typical pedon of Downs silt loam, 2 to 5 percent slopes, 1,520 feet south and 400 feet west of the northeast corner of sec. 32, T. 16 N., R. 9 E.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

BE—8 to 12 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to moderate medium granular; friable; common fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—12 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings in linings and many distinct dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—27 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds and few faint very dark grayish brown (10YR 3/2) clay films in linings; common fine soft accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—36 to 41 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; friable; few fine roots; common faint dark brown (10YR 4/3) clay films on faces of peds; common fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt5—41 to 50 inches; yellowish brown (10YR 5/4) silt loam; common fine faint grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; friable; few fine roots; common faint dark brown (10YR 4/3) clay films on faces of peds; common fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium faint grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; neutral.

The thickness of the solum ranges from 50 to more than 60 inches. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has chroma of 3 or 4. The lower part of this horizon is silt loam or silty clay loam. The C horizon has value of 4 or 5.

Drummer Series

The Drummer series consists of poorly drained, moderately permeable soils in drainageways and on broad flats on outwash plains. These soils formed in loess and in the underlying stratified outwash. Slope ranges from 0 to 2 percent.

Drummer soils are similar to Hartsburg, Pella, Sable, and Selma soils. Hartsburg and Pella soils have carbonates within a depth of 40 inches. Sable soils formed entirely in loess. Selma soils have more sand in the upper part than the Drummer soils.

Typical pedon of Drummer silty clay loam, 205 feet east and 2,140 feet south of the center of sec. 6, T. 16 N., R. 7 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A—9 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent olive brown (2.5Y 4/4) mottles; moderate medium granular structure; friable; common fine roots; neutral; clear smooth boundary.

BA—14 to 19 inches; very dark grayish brown (2.5Y 3/2) silty clay loam; few fine distinct olive brown (2.5Y 4/4) and common fine distinct grayish brown (2.5Y 5/2) mottles; moderate fine subangular blocky structure; friable; few fine roots; few distinct black (5Y 2.5/1) clay films on faces of peds; neutral; clear smooth boundary.

Btg1—19 to 24 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; many faint dark grayish brown (2.5Y 4/2) and few faint black (5Y 2.5/1) clay films on faces of peds; black (10YR 2/1) krotovinas; neutral; clear smooth boundary.

Btg2—24 to 32 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine faint light brownish gray (2.5Y 6/2) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; black (10YR 2/1) krotovinas; neutral; clear smooth boundary.

Btg3—32 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine faint light brownish gray (2.5 6/2) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; very dark grayish brown (2.5Y 3/2) krotovinas; neutral; clear smooth boundary.

2Btg4—44 to 52 inches; gray (5Y 5/1), stratified clay loam and silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common fine distinct light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; friable; few distinct grayish brown (2.5Y 5/2) clay films on faces of peds; common yellowish red (5YR 5/6) accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2Cg—52 to 60 inches; gray (5Y 5/1), stratified sandy loam, loam, and clay loam; common fine distinct light brownish gray (2.5Y 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; many concretions of calcium carbonate; few pebbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to more than 60 inches. The mollic epipedon ranges from 12 to 20 inches in thickness.

The Ap and A horizons have hue of 10YR or 2.5Y or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2. The Btg horizon has hue of 5Y or 2.5Y, value of 3 to 5, and chroma of 1 or 2. The 2Btg horizon is silt loam, loam, clay loam, or sandy clay loam.

Edgington Series

The Edgington series consists of poorly drained, moderately slowly permeable soils in depressions on uplands. These soils formed in a thick layer of loess.

Slope ranges from 0 to 2 percent.

Edgington soils are similar to Thorp soils. Thorp soils formed in loess and glacial outwash.

Typical pedon of Edgington silt loam, 1,480 feet west and 415 feet south of the northeast corner of sec. 24, T. 16 N., R. 8 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

A—8 to 13 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

Eg1—13 to 18 inches; dark gray (10YR 4/1) and gray (10YR 5/1) silt loam, light gray (10YR 6/1) dry; moderate medium platy structure; very friable; few fine roots; strongly acid; clear smooth boundary.

Eg2—18 to 23 inches; dark gray (10YR 4/1) and gray (10YR 5/1) silt loam, light brownish gray (10YR 6/2) dry; common medium prominent dark reddish brown (5YR 3/4) and few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium platy structure; friable; few fine roots; few fine rounded dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

EBg—23 to 27 inches; dark gray (10YR 4/1) and gray (10YR 5/1) silt loam; common medium prominent dark reddish brown (5YR 3/4) and few medium prominent strong brown (7.5YR 5/6) mottles; weak thick platy structure parting to weak fine subangular blocky; friable; few fine roots; few fine rounded dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Btg1—27 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent dark reddish brown (5YR 3/4) and strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Btg2—34 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; moderate medium prismatic structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

BCg—45 to 55 inches; light gray (5Y 6/1) silty clay loam; many medium prominent yellowish red (5YR 5/6) mottles; weak medium prismatic structure; friable; few distinct grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Cg—55 to 60 inches; light gray (5Y 6/1) silt loam; many medium prominent yellowish red (5YR 5/6) mottles; massive; friable; slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The Ap and A horizons have value of 2 or 3. The Eg horizon has value of 4 to 6 and chroma of 1 or 2. Some pedons do not have an EB horizon. The Btg horizon has value of 5 or 6.

Edwards Series

The Edwards series consists of very poorly drained soils in depressions on moraines and outwash plains. These soils formed in organic material over marl. Permeability is moderately slow to moderately rapid in the organic material and varies in the marl. Slope ranges from 0 to 2 percent.

Edwards soils are similar to Aurelius, Houghton, and Lena soils. Aurelius soils have an organic layer that is less than 16 inches thick and are underlain by marl and sandy material. Houghton and Lena soils have an organic layer that is more than 51 inches thick.

Typical pedon of Edwards muck, 1,200 feet east and 1,848 feet north of the southwest corner of sec. 2, T. 17 N., R. 7 E.

Oap—0 to 8 inches; black (N 2/0) sapric material; about 5 percent fiber, 1 percent rubbed; moderate medium granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

Oa—8 to 20 inches; black (N 2/0) sapric material; about 10 percent fiber, 2 percent rubbed; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium granular structure; friable; common fine roots; neutral; clear smooth boundary.

Cg1—20 to 27 inches; very dark grayish brown (10YR 3/2) coprogenous earth; few fine faint dark grayish brown (2.5Y 4/2) and common fine prominent red (2.5YR 4/8) mottles; moderate medium platy structure; friable; few fine roots; many soft, small shells; mildly alkaline; clear smooth boundary.

Cg2—27 to 38 inches; light brownish gray (2.5Y 6/2) marl; common medium distinct dark yellowish brown (10YR 4/4), few fine prominent strong brown (7.5YR 5/6), and common medium faint grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; friable; many soft, small shells; violent effervescence; moderately alkaline; clear smooth boundary.

Cg3—38 to 47 inches; grayish brown (2.5Y 5/2) marl; few fine prominent strong brown (7.5YR 5/6), common medium distinct yellowish brown (10YR 5/4), and common medium faint light brownish gray (2.5Y 6/2) mottles; massive; friable; many soft, small shells; violent effervescence; moderately alkaline; clear smooth boundary.

Cg4—47 to 60 inches; grayish brown (2.5Y 5/2) and olive gray (5Y 4/2), stratified marl and coprogenous earth; few medium prominent strong brown (7.5YR 5/6) and common medium distinct gray (5Y 5/1) mottles; massive; many soft, small shells; strong effervescence; mildly alkaline.

The depth to marl ranges from 16 to 40 inches. The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The Cg horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 3 to 6.

Elburn Series

The Elburn series consists of somewhat poorly drained soils on till plains, outwash plains, and stream terraces. These soils formed in loess and in the underlying stratified loamy outwash. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 0 to 2 percent.

Elburn soils are similar to Brenton, Flanagan, Joy, Lisbon, and Muscatine soils. Brenton soils have a mantle of loess that is thinner than that of the Elburn soils. Flanagan and Lisbon soils formed in loess and glacial till. Joy and Muscatine soils formed entirely in loess.

Typical pedon of Elburn silt loam, 308 feet west and 1,540 feet south of the northeast corner of sec. 30, T. 15 N., R. 8 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common very fine and few fine roots; slightly acid; abrupt smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; friable; common very fine and few fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—14 to 23 inches; brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate fine and very fine subangular blocky structure; friable; few very fine roots; few distinct dark brown (10YR 3/3) clay films and few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt2—23 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; many fine faint yellowish brown (10YR 5/6) and many fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; few very fine roots; few distinct brown (10YR 4/3) and common distinct dark brown (10YR 3/3) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—31 to 42 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt4—42 to 52 inches; light olive brown (2.5Y 5/4) silt loam; common fine distinct yellowish brown (10YR 5/6) and common medium distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; friable; few very fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine and medium dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2BC—52 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; loose; few distinct brown (10YR 4/3) clay bridges between sand grains; few fine dark accumulations of iron and manganese oxide; neutral.

The thickness of the solum ranges from 45 to 70 inches and is commonly the same as the depth to carbonates. The mollic epipedon is 10 to 18 inches thick.

Some pedons have a BA horizon. The Bt horizon has value of 3 to 6 and chroma of 2 to 4. The 2BC horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 to 4. It is silt loam, loam, or sandy loam.

Elkhart Series

The Elkhart series consists of well drained, moderately permeable soils on loess-covered uplands. These soils formed in loess. Slope ranges from 5 to 15 percent.

The Elkhart soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Elkhart soils are similar to Assumption, Batavia, Catlin, Downs, Plano, Sylvan, and Tama soils. Assumption soils have a paleosol within a depth of 60 inches. Batavia and Plano soils formed in loess and glacial outwash. Catlin soils formed in loess and glacial till. Downs and Tama soils do not have carbonates within a depth of 40 inches. Sylvan soils have a surface layer that is lighter colored than that of the Elkhart soils.

Typical pedon of Elkhart silt loam, 5 to 10 percent slopes, eroded, 1,720 feet east and 840 feet north of the southwest corner of sec. 14, T. 15 N., R. 6 E.

Ap—0 to 8 inches; mixed dark brown (10YR 3/3) and brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 15 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; many very fine roots; common distinct dark brown (10YR 3/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint brown (10YR 5/3) relict mottles; moderate medium subangular blocky structure; friable; many very fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt3—21 to 25 inches; yellowish brown (10YR 5/4) silt loam; common fine faint brown (10YR 5/3) and few fine faint yellowish brown (10YR 5/6) relict mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; few fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

BC—25 to 34 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) relict mottles; weak coarse subangular blocky structure; friable; few very fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

C1—34 to 41 inches; brownish yellow (10YR 6/6) silt loam; common fine and medium distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/8) relict mottles; massive; friable; few fine soft accumulations of iron and manganese oxide; slight effervescence; mildly alkaline; clear smooth boundary.

C2—41 to 60 inches; brownish yellow (10YR 6/6) silt loam; many medium distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/8) relict mottles; massive; friable; few fine soft accumulations of iron and manganese oxide; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The Ap horizon has value of 2 to 5 and chroma of 2 to 6. It is silt loam or silty clay loam. Some pedons have a BA horizon. The Bt horizon has chroma of 3 to 6. The BC horizon has chroma of 4 to 6.

Fayette Series

The Fayette series consists of well drained, moderately permeable soils on loess-covered till plains. These soils formed in loess. Slope ranges from 2 to 15 percent.

Fayette soils are similar to Birkbeck, Camden, Dodge, Marseilles, Rozetta, St. Charles, and Sylvan soils. Birkbeck and Dodge soils formed in loess and glacial till. Camden and St. Charles soils formed in loess and glacial outwash. Marseilles soils formed in loess and material weathered from shale. Rozetta soils are moderately well drained. Sylvan soils have carbonates within a depth of 40 inches.

Typical pedon of Fayette silt loam, 2 to 5 percent slopes, 450 feet north and 1,320 feet east of the southwest corner of sec. 17, T. 15 N., R. 9 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—6 to 9 inches; brown (10YR 5/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium platy structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; strong medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt3—24 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt4—32 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt5—42 to 53 inches; yellowish brown (10YR 5/4) silt loam; common fine faint yellowish brown (10YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

BC—53 to 60 inches; yellowish brown (10YR 5/6) silt loam; common fine faint yellowish brown (10YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 47 to more than 60 inches. The Ap horizon has chroma of 2 or 3. It is silt loam or silty clay loam. The E horizon has value of 4 or 5 and chroma of 3 or 4. The Bt horizon has value of 4 or 5. Some pedons have mottles with chroma of 2 below a depth of 30 inches. Some pedons have a C horizon within a depth of 60 inches. This horizon is silt loam.

Flanagan Series

The Flanagan series consists of somewhat poorly drained soils on till plains. These soils formed in 40 to 60 inches of loess and in the underlying glacial till. They are moderately permeable in the upper part and moderately slowly permeable in the lower part. Slope ranges from 0 to 2 percent.

The Flanagan soils in this county are taxadjuncts because they have a slightly lower content of clay in the argillic horizon than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Flanagan soils are similar to Brenton, Elburn, Joy, Lisbon, and Muscatine soils. Brenton and Elburn soils formed in loess and glacial outwash. Joy and Lisbon soils formed in a mantle of loess that is shallower over glacial till than that of the Flanagan soils. Muscatine soils formed entirely in loess.

Typical pedon of Flanagan silt loam, 1,950 feet south and 510 feet west of the northeast corner of sec. 22, T. 16 N., R. 11 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; friable; common very fine roots; medium acid; clear smooth boundary.

A—8 to 13 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common very fine roots; few fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt1—13 to 21 inches; dark brown (10YR 4/3) silty clay loam; few fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; common very fine roots; common distinct dark brown (10YR 3/3) clay films and few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—21 to 31 inches; brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; friable; common very fine roots; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—31 to 45 inches; grayish brown (10YR 5/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; friable; few very fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds and few distinct very dark grayish brown (10YR 3/2) organic coatings lining pores; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt4—45 to 56 inches; light brownish gray (10YR 6/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; weak medium prismatic structure; friable; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine and medium dark accumulations of iron and manganese oxide; slight effervescence; mildly alkaline; clear smooth boundary.

2BC—56 to 58 inches; light brownish gray (2.5Y 6/2) silt loam; common fine and medium distinct brownish yellow (10YR 6/8) mottles; weak coarse prismatic structure; friable; few fine and medium dark accumulations of iron and manganese oxide; few till pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

2C—58 to 60 inches; light brownish gray (2.5Y 6/2) loam; many fine and medium distinct yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8) mottles; massive; firm; common fine dark accumulations of iron and manganese oxide and few medium light colored concretions of calcium carbonate; mildly alkaline; few till pebbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The mollic epipedon ranges from 10 to 17 inches in thickness.

The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. The 2BC horizon is silt loam, loam, clay loam, or silty clay loam. The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is loam, clay loam, or silty clay loam.

Gilford Series

The Gilford series consists of poorly drained soils on outwash plains. 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. Slope ranges from 0 to 2 percent.

Gilford soils are similar to Hoopeston and Selma soils. Hoopeston soils are somewhat poorly drained. Selma soils have a higher content of clay in the control section than the Gilford soils.

Typical pedon of Gilford loam, occasionally flooded, 960 feet north and 1,576 feet east of the center of sec. 2, T. 17 N., R. 6 E.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—10 to 13 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; common fine prominent dark grayish brown (2.5Y 4/2) and light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bg1—13 to 22 inches; grayish brown (2.5Y 5/2) fine sandy loam; common fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; common fine roots; black (10YR 2/1) krotovinas; neutral; clear smooth boundary.

Bg2—22 to 33 inches; light brownish gray (10YR 6/2) fine sandy loam; common fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; very friable; few fine roots; black (10YR 2/1) krotovinas; neutral; clear smooth boundary.

2C1—33 to 51 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; mildly alkaline; gradual smooth boundary.

2C2—51 to 60 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 23 inches.

The Ap and A horizons have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2. The Bg horizon has value of 4 to 6 and chroma of 1 or 2. It is fine sandy loam, loam, or sandy clay loam. The 2C horizon has value of 6 or 7. It is sand or fine sand.

Harpster Series

The Harpster series consists of poorly drained, moderately permeable soils on outwash plains, lake plains, and till plains. These soils formed in calcareous, silty material. Slope ranges from 0 to 2 percent.

Harpster soils are similar to Canisteo, Hartsburg, Pella, and Prophetstown soils. Canisteo soils have more sand throughout the solum than the Harpster soils. Hartsburg and Pella soils do not have carbonates within a depth of 15 inches. Prophetstown soils have a lower content of clay in the control section than the Harpster soils.

Typical pedon of Harpster silty clay loam, 1,452 feet south and 990 feet west of the northeast corner of sec. 8, T. 16 N., R. 6 E.

Akp—0 to 8 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate medium granular structure; few fine roots; friable; many snail shell fragments; violent effervescence; moderately alkaline; abrupt smooth boundary.

Ak—8 to 18 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine subangular blocky structure; friable; few fine roots; many snail shell fragments; violent effervescence; moderately alkaline; clear smooth boundary.

Bkg1—18 to 26 inches; dark gray (10YR 4/1) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct very dark gray (N 3/0) organic coatings on faces of peds; black (N 2/0) krotovinas; many snail shell fragments; violent effervescence; moderately alkaline; clear smooth boundary.

Bkg2—26 to 32 inches; dark gray (5Y 4/1) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; black (N 2/0) krotovinas; many snail shells; violent effervescence; moderately alkaline; clear smooth boundary.

Cg—32 to 60 inches; gray (5Y 5/1) silt loam; many fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 26 to 46 inches. The mollic epipedon ranges from 10 to 20 inches in thickness.

The Ak horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The Bkg horizon has hue of 10YR, 5Y, or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The Cg horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 to 6, and chroma of 1 to 8.

Hartsburg Series

The Hartsburg series consists of poorly drained, moderately permeable soils on lake plains and till plains. These soils formed in loess. Slope ranges from 0 to 2 percent.

Hartsburg soils are similar to Drummer, Harpster, Pella, Prophetstown, and Sable soils. Drummer and Sable soils do not have carbonates within a depth of 40 inches. Harpster and Prophetstown soils have carbonates within a depth of 16 inches. Pella soils formed in silty material underlain by stratified, loamy outwash.

Typical pedon of Hartsburg silty clay loam, 840 feet east and 24 feet south of the northwest corner of sec. 31, T. 17 N., R. 6 E.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; zone of compaction between depths of 3 and 8 inches; neutral; abrupt smooth boundary.

A1—8 to 13 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine roots; zone of compaction between depths of 8 and 11 inches; neutral; clear smooth boundary.

A2—13 to 19 inches; very dark gray (N 3/0) silty clay loam, grayish brown (10YR 5/2) dry; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; neutral; abrupt smooth boundary.

Bg—19 to 28 inches; dark gray (5Y 4/1) silty clay loam; few fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; black (N 2/0) krotovinas of silty clay loam; few snail shells; slight effervescence; mildly alkaline; clear smooth boundary.

Bkg1—28 to 35 inches; olive gray (5Y 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark gray (5Y 4/1) clay films on faces of peds; few very fine concretions of calcium carbonate; black (N 2/0) krotovinas of silty clay loam; few snail shells; strong effervescence; mildly alkaline; clear smooth boundary.

Bkg2—35 to 40 inches; olive gray (5Y 5/2) silt loam; common medium prominent yellowish red (5YR 5/8) mottles; weak fine prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few distinct dark gray (5Y 4/1) clay films on faces of peds; few very fine concretions of calcium carbonate; very dark gray (N 3/0) krotovinas; strong effervescence; mildly alkaline; clear smooth boundary.

Cg—40 to 60 inches; light olive gray (5Y 6/2) silt loam; many medium prominent yellowish red (5YR 5/8) and strong brown (7.5YR 5/6) mottles; massive; friable; few fine concretions of calcium carbonate; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 25 to 42 inches. The depth to free carbonates ranges from 15 to 35 inches. The mollic epipedon ranges from 15 to 20 inches in thickness.

The Ap and A horizons have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 or 1. The Bkg horizon has hue of 10YR, 2.5Y, or 5Y and value of 4 or 5.

Hennepin Series

The Hennepin series consists of well drained, moderately slowly permeable soils in the uplands. These soils formed in glacial till. Slope ranges from 12 to 60 percent.

Hennepin soils are similar to Miami soils. Miami soils have an argillic horizon and do not have carbonates within a depth of 16 inches.

Typical pedon of Hennepin loam, 30 to 60 percent slopes, 528 feet west and 845 feet south of the northeast corner of sec. 13, T. 15 N., R. 8 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

Bw1—4 to 9 inches; dark brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; common fine roots; common faint distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

Bw2—9 to 16 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; few fine roots; common faint distinct dark brown (10YR 4/3) clay films on faces of peds; few pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

C—16 to 60 inches; dark brown (7.5YR 4/4) loam; massive; friable; few fine roots; few pebbles; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 20 inches. The A horizon is loam or silt loam. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

Hickory Series

The Hickory series consists of well drained, moderately permeable soils on uplands. These soils formed in a thin mantle of loess and in the underlying Illinoian glacial till. Slope ranges from 10 to 35 percent.

Hickory soils are similar to Martinsville and Miami soils. Martinsville soils formed in glacial outwash. Miami soils formed in Wisconsin glacial till and have carbonates within a depth of 40 inches.

Typical pedon of Hickory silt loam, 18 to 35 percent slopes, 2,520 feet west and 320 feet south of the northeast corner of sec. 18, T. 15 N., R. 6 E.

A—0 to 4 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; many very fine and common fine roots; few till pebbles; slightly acid; clear smooth boundary.

Bt1—4 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; many very fine and common fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of manganese oxide; few till pebbles; medium acid; clear smooth boundary.

2Bt2—13 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium and fine subangular blocky structure; friable; common very fine and few fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of manganese oxide; few till pebbles; medium acid; clear smooth boundary.

2Bt3—23 to 31 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few very fine and fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; few till pebbles; medium acid; gradual wavy boundary.

2Bt4—31 to 40 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse and medium subangular blocky structure; firm; few very fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; few till pebbles; medium acid; clear smooth boundary.

2Bt5—40 to 54 inches; dark brown (7.5YR 4/4) clay loam; weak coarse subangular blocky structure; firm; common distinct dark reddish brown (5YR 3/3) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; few till pebbles; medium acid; clear smooth boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; common distinct dark brown (7.5YR 4/4) clay films lining pores; few till pebbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. The loess is less than 20 inches thick.

The A or Ap horizon has value of 2 to 4 and chroma of 2 or 3. It is silt loam, loam, or clay loam. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 5.

Hononegah Series

The Hononegah series consists of excessively drained, very rapidly permeable soils on stream terraces and outwash plains. These soils formed in sandy eolian material over water-sorted sand and gravel. Slope ranges from 5 to 10 percent.

The Hononegah soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Hononegah soils are similar to Rodman and Sparta soils. Rodman soils have a solum that is thinner than that of the Hononegah soils and have a higher content of gravel in the upper part. Sparta soils have a lower content of gravel than the Hononegah soils.

Typical pedon of Hononegah sandy loam, 5 to 10 percent slopes, eroded, 1,090 feet west and 2,121 feet south of the northeast corner of sec. 12, T. 18 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, dark brown (10YR 4/3) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bw1—8 to 12 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few fine roots; common faint dark brown (10YR 4/3) clay films bridging sand grains; medium acid; clear smooth boundary.

Bw2—12 to 25 inches; dark yellowish brown (10YR 4/4) sand; very weak medium subangular blocky structure; loose; slightly acid; clear smooth boundary.

Bt1—25 to 28 inches; dark brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common faint dark brown (7.5YR 3/2) clay films bridging sand grains; slightly acid; clear smooth boundary.

Bt2—28 to 32 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; many faint dark brown (7.5YR 3/2) clay films bridging sand grains; few small pebbles; neutral; clear smooth boundary.

2C—32 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; violent effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches and commonly are the same as the depth to gravelly material.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The Bw and Bt horizons have value of 3 or 4 and chroma of 2 to 4. The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is gravelly sand or very gravelly sand.

Hoopeston Series

The Hoopeston series consists of somewhat poorly drained soils on outwash plains. 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. Slope ranges from 0 to 2 percent.

Hoopeston soils are similar to Gilford and Lawler soils. Gilford soils are poorly drained. Lawler soils have less sand in the upper part than the Hoopeston soils.

Typical pedon of Hoopeston loam, 2,554 feet south and 864 feet east of the northwest corner of sec. 24, T. 17 N., R. 6 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—10 to 16 inches; dark brown (10YR 3/3) sandy loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

Bw—16 to 23 inches; dark brown (10YR 4/3) sandy loam; common fine distinct strong brown (7.5YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; very friable; few fine roots; slightly acid; clear smooth boundary.

BC—23 to 34 inches; pale brown (10YR 6/3) loamy sand; common medium distinct strong brown (7.5YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; very friable; few fine roots; many medium dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

C1—34 to 48 inches; pale brown (10YR 6/3), stratified loamy sand and sandy loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint light gray (10YR 7/2) mottles; single grain; loose; few fine dark reddish brown (5YR 3/3) accumulations of iron and manganese oxide; medium acid; gradual smooth boundary.

C2—48 to 60 inches; pale brown (10YR 6/3) fine sand; common medium distinct strong brown (7.5YR 5/6) and common fine faint light brownish gray (10YR 6/2) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 34 to 44 inches. The mollic epipedon ranges from 10 to 18 inches in thickness.

The Ap and A horizons have value of 2 or 3 and chroma of 1 to 3. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. In some pedons it has layers of loam or sandy clay loam less than 6 inches thick.

Houghton Series

The Houghton series consists of very poorly drained, moderately slowly to moderately rapidly permeable soils on outwash plains and moraines. These soils formed in herbaceous deposits more than 51 inches thick. Slope is less than 2 percent.

Houghton soils are similar to Aurelius, Edwards, Lena, and Wallkill soils. Aurelius soils formed in less than 16 inches of organic material and in the underlying marl and sandy material. Edwards soils formed in coprogenous earth and organic material underlain by marl. Lena soils have free carbonates throughout. Wallkill soils formed in silty colluvium.

Typical pedon of Houghton muck, 312 feet north and 384 feet west of the southeast corner of sec. 2, T. 16 N., R. 6 E.

Oap—0 to 10 inches; sapric material, black (N 2/0) rubbed; about 20 percent fiber, 5 percent rubbed; moderate medium granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

Oa1—10 to 21 inches; sapric material, black (N 2/0) rubbed; about 25 percent fiber, 10 percent rubbed; weak fine subangular blocky structure; very friable; few fine roots; slightly acid; clear smooth boundary.

Oa2—21 to 29 inches; sapric material, black (10YR 2/1) rubbed; about 50 percent fiber, 15 percent rubbed; moderate medium subangular blocky structure; very friable; few fine roots; neutral; clear smooth boundary.

Oa3—29 to 37 inches; sapric material, black (N 2/0) rubbed; about 50 percent fiber, 15 percent rubbed; weak medium subangular blocky structure; very friable; few fine roots; neutral; clear smooth boundary.

Oa4—37 to 60 inches; sapric material, black (N 2/0) rubbed, about 50 percent fiber, 15 percent rubbed; massive; friable; few fine roots; mildly alkaline.

The sapric material is more than 51 inches thick. Some pedons contain woody fragments, which cannot be crushed between the fingers.

The subsurface tiers are dominantly sapric material, but thin strata of hemic and fibric material are in some pedons. The organic material has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 6.

Jasper Series

The Jasper series consists of well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in silty eolian material and in loamy material deposited by water. Slope ranges from 0 to 5 percent.

Jasper soils are similar to La Rose, Parr, and Warsaw soils. La Rose and Parr soils formed in glacial till. Warsaw soils have sandy material within a depth of 40 inches.

Typical pedon of Jasper silt loam, 0 to 2 percent slopes, 1,580 feet west and 860 feet south of the northeast corner of sec. 30, T. 16 N., R. 9 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—8 to 18 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak coarse and medium granular structure; friable; common fine roots; neutral; clear smooth boundary.

BA—18 to 24 inches; brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium subangular blocky structure parting to moderate fine granular; friable; many distinct dark brown (10YR 3/3) organic coatings on faces of peds; common fine roots; neutral; clear smooth boundary.

Bt1—24 to 28 inches; brown (10YR 4/3) silt loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; friable; many distinct dark brown (10YR 3/3) clay films on faces of peds; common fine roots; neutral; clear smooth boundary.

Bt2—28 to 37 inches; brown (10YR 4/3) loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many distinct dark brown (10YR 3/3) clay films on faces of peds; common fine roots; neutral; clear smooth boundary.

BC—37 to 44 inches; dark yellowish brown (10YR 4/4) sandy loam; strata of gravelly sandy loam with distinct clay films on pebbles between depths of 42 and 44 inches; weak coarse and medium subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—44 to 50 inches; yellowish brown (10YR 5/4) loam; massive; friable; slight effervescence; mildly alkaline; clear smooth boundary.

C2—50 to 60 inches; yellowish brown (10YR 5/4), stratified silt loam and loam; massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 36 to 48 inches. The thickness of the mollic epipedon ranges from 10 to 22 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 to 3. The Bt horizon has value of 3 to 5 and chroma of 3 or 4. It is silt loam, loam, or clay loam. The C horizon is loam, silt loam, or sandy loam.

Joy Series

The Joy series consists of somewhat poorly drained soils on outwash plains. These soils formed in loess and in the underlying sandy material. Permeability is moderate in the loess and rapid in the sandy underlying material. Slope ranges from 0 to 2 percent.

The Joy soils in this county are taxadjuncts because they have a weakly expressed argillic horizon, which is not definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Joy soils are similar to Brenton, Elburn, Flanagan, Lisbon, and Muscatine soils. The similar soils have a higher content of clay in the subsoil than the Joy soils. Brenton and Elburn soils are underlain by medium textured outwash. Flanagan and Lisbon soils formed in loess and glacial till. Muscatine soils do not have a sandy or loamy texture within a depth of 60 inches.

Typical pedon of Joy silt loam, sandy substratum, 440 feet north and 174 feet east of the southwest corner of sec. 4, T. 18 N., R. 6 E.

Ap—0 to 12 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

AB—12 to 19 inches; very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) silt loam; weak fine subangular blocky structure; friable; common distinct very dark gray (10YR 3/1) clay films on faces of peds; few fine roots; neutral; clear smooth boundary.

Bt1—19 to 27 inches; grayish brown (2.5Y 5/2) silt loam; moderate medium subangular blocky structure; friable; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine roots; medium acid; clear smooth boundary.

Bt2—27 to 33 inches; grayish brown (2.5Y 5/2) silt loam; moderate medium subangular blocky structure; friable; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine roots; medium acid; clear smooth boundary.

Bt3—33 to 41 inches; grayish brown (2.5Y 5/2) silt loam; moderate medium subangular blocky structure; friable; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine roots; slightly acid; clear smooth boundary.

2C—41 to 60 inches; dark brown (10YR 4/3) loamy sand; common fine distinct grayish brown (2.5Y 5/2) and pale brown (10YR 6/3) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 41 to 55 inches. The thickness of the mollic epipedon ranges from 11 to 16 inches.

The Ap horizon has value of 2 or 3 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 or 3. The 2C horizon is loamy sand or sand.

Kane Series

The Kane series consists of somewhat poorly drained soils on outwash plains and stream terraces. These soils formed in loamy outwash and stratified, calcareous gravel and sand. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slope ranges from 0 to 2 percent.

Kane soils are similar to La Hogue, Lawler, and Udolpho soils. La Hogue soils are not sandy in the lower part. Lawler soils have a lower content of clay in the subsoil than the Kane soils. Udolpho soils are poorly drained.

Typical pedon of Kane loam, 1,488 feet west and 1,722 feet south of the northeast corner of sec. 2, T. 18 N., R. 8 E.

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

A—9 to 12 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common very fine roots; slightly acid; clear smooth boundary.

Bt1—12 to 18 inches; dark grayish brown (10YR 4/2) clay loam; common medium faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; common very fine roots; few distinct black (10YR 2/1) clay films on faces of peds; slightly acid; clean smooth boundary.

Bt2—18 to 27 inches; dark brown (10YR 4/3) sandy clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine faint dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

2C1—27 to 36 inches; yellowish brown (10YR 5/6) gravelly loamy sand; few fine distinct strong brown (7.5YR 5/8) mottles; single grain; loose; few very fine roots; few fine concretions of iron and manganese oxide; neutral; clear smooth boundary.

2C2—36 to 60 inches; dark brown (10YR 4/3) very gravelly sand; single grain; loose; few fine concretions of iron and manganese oxide; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 40 inches and is commonly the same as the depth to the gravelly material.

The Ap and A horizons have chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5YR, value of 4 to 6, and chroma of 2 to 6. It is clay loam, silty clay loam, or sandy clay loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 8. It is gravelly loamy sand, gravelly sand, or very gravelly sand.

La Hogue Series

The La Hogue series consists of somewhat poorly drained soils on stream terraces. These soils formed in loamy sediments and in the underlying stratified, loamy and sandy material. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 0 to 2 percent.

La Hogue soils are similar to Kane and Lawler soils. Kane and Lawler soils have sandy material within a depth of 40 inches.

Typical pedon of La Hogue loam, 1,716 feet north and 460 feet east of the southwest corner of sec. 10, T. 16 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

A—9 to 15 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate medium and coarse granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

BA—15 to 22 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) clay loam; few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine and fine subangular blocky structure; friable; few fine roots; common faint very dark gray (10YR 3/1) organic coatings on faces of peds; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bt1—22 to 28 inches; dark brown (10YR 4/3) clay loam; common fine faint brown (10YR 5/3) and few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bt2—28 to 35 inches; dark brown (10YR 4/3) clay loam; common fine prominent strong brown (7.5YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark brown (10YR 3/3) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt3—35 to 42 inches; yellowish brown (10YR 5/4) loam; few fine distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; common fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; common dark krotovinas; neutral; clear smooth boundary.

Bt4—42 to 49 inches; grayish brown (2.5Y 5/2) loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; few fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; few dark concretions of iron and manganese oxide; common dark krotovinas; neutral; clear smooth boundary.

Cg—49 to 60 inches; light brownish gray (2.5Y 6/2) loam that has strata of loamy sand; common medium strong brown (7.5YR 5/8) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; common dark krotovinas; mildly alkaline.

The thickness of the solum ranges from 40 to 52 inches. The mollic epipedon ranges from 12 to 24 inches in thickness.

The Bt horizon is clay loam, loam, silt loam, or sandy loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. In some pedons it has strata of fine gravel or coarse sand.

La Rose Series

The La Rose series consists of well drained, moderately permeable soils on moraines. These soils formed in loamy glacial till. Slope ranges from 5 to 15 percent.

La Rose soils are similar to Jasper, Parr, and Saybrook soils. The similar soils do not have carbonates within a depth of 24 inches. Jasper soils formed in glacial outwash. Saybrook soils formed in loess and glacial till.

Typical pedon of La Rose silt loam, 5 to 10 percent slopes, eroded, 810 feet south and 1,370 feet east of the northwest corner of sec. 4, T. 18 N., R. 9 E.

Ap—0 to 7 inches; mixed very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt—7 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; weak fine subangular blocky structure; friable; few fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; few very dark grayish brown (10YR 3/2) peds of Ap material mixed in the upper part; few pebbles; neutral; clear smooth boundary.

BC—16 to 20 inches; brown (7.5YR 5/4) loam; weak medium subangular blocky structure; friable; few fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; few pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

C1—20 to 40 inches; brown (7.5YR 5/4) loam; massive; friable; few pebbles; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—40 to 60 inches; brown (7.5YR 5/4) loam; few fine faint strong brown (7.5YR 5/8) mottles; massive; firm; few pebbles; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 11 to 20 inches. The Ap horizon is silt loam or clay loam. The Bt horizon has hue of 10YR or 7.5YR and value of 4 or 5. Some pedons do not have a BC horizon. The C horizon has hue of 10YR or 7.5YR.

La Rose clay loam, 5 to 10 percent slopes, severely eroded, and La Rose clay loam, 10 to 15 percent slopes, severely eroded, are taxadjuncts because they have a thinner surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Lamont Series

The Lamont series consists of well drained soils on dunes on outwash plains, stream terraces, and moraines. These soils formed in loamy eolian material. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slope ranges from 2 to 15 percent.

Typical pedon of Lamont fine sandy loam, 2 to 5 percent slopes, 2,180 feet north and 1,460 feet east of the southwest corner of sec. 14, T. 18 N., R. 7 E.

Ap—0 to 9 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) fine sandy loam, yellowish brown (10YR 5/4) dry; moderate fine granular structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 13 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; very friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—20 to 29 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

BC—29 to 39 inches; yellowish brown (10YR 5/4) loamy fine sand; weak coarse subangular blocky structure; very friable; dark brown (7.5YR 4/4) bands of loamy fine sand 1 centimeter thick at depths of 31, 35, and 37 inches; strongly acid; clear smooth boundary.

E&Bt—39 to 60 inches; yellowish brown (10YR 5/4) fine sand (E part); single grain; loose; dark brown (7.5YR 4/4) bands of loamy fine sand 1 centimeter thick at depths of 43 and 53 inches and fine sandy loam at a depth of 59 inches (Bt part); slightly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The Ap horizon has value of 4 to 6 and chroma of 3 or 4. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, loam, or sandy clay loam. In the E&Bt horizon, the combined thickness of the bands of sandy loam or loamy fine sand is less than 6 inches within a depth of 60 inches.

Landes Series

The Landes series consists of well drained and moderately well drained soils on natural levees, low benches, and the higher parts on flood plains. These soils formed in loamy and sandy alluvial sediments. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slope ranges from 0 to 2 percent.

Landes soils are similar to Dickinson and Ross soils. Dickinson soils are not fluventic. Ross soils are cumulic.

Typical pedon of Landes fine sandy loam, rarely flooded, 1,376 feet east and 1,760 feet north of the southwest corner of sec. 27, T. 16 N., R. 8 E.

Ap—0 to 10 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

A—10 to 19 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark brown (10YR 4/3) dry; moderate medium granular structure; friable; few fine roots; few distinct very dark brown (10YR 2/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw1—19 to 25 inches; dark brown (10YR 4/3) fine sandy loam; moderate fine subangular blocky structure; friable; few fine roots; few distinct very dark grayish brown (10YR 3/2) and many distinct dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw2—25 to 32 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; few fine roots; mildly alkaline; clear smooth boundary.

C1—32 to 49 inches; dark yellowish brown (10YR 4/4) fine sandy loam; massive; very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C2—49 to 59 inches; yellowish brown (10YR 5/4) fine sandy loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

C3—59 to 61 inches; yellowish brown (10YR 5/4) sand; single grain; loose; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 25 to 52 inches. The mollic epipedon ranges from 10 to 23 inches in thickness.

The Ap and A horizons have chroma of 1 or 2. They are silt loam or fine sandy loam. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. It is fine sandy loam, loamy fine sand, or loam. The C horizon has value of 4 to 6 and chroma of 3 or 4. It is fine sandy loam, loamy fine sand, fine sand, or sand and in some pedons has thin strata of loam or silt loam.

Lawler Series

The Lawler series consists of somewhat poorly drained soils on outwash plains. These soils formed in loess and in the underlying sandy material. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 2 percent.

The Lawler soils in this county are taxadjuncts because they have an argillic horizon. This difference, however, does not significantly affect the use or behavior of the soils.

Lawler soils are similar to Kane and La Hogue soils. Kane and La Hogue soils have a higher content of clay in the subsoil than the Lawler soils. La Hogue soils do not have a sandy texture within a depth of 40 inches.

Typical pedon of Lawler silt loam, 1,584 feet west and 1,138 feet north of the southeast corner of sec. 12, T. 17 N., R. 6 E.

Ap—0 to 10 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 16 inches; dark brown (10YR 4/3) silt loam; few fine faint dark grayish brown (10YR 4/2) and few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—16 to 26 inches; brown (10YR 4/3) silt loam; common fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—26 to 31 inches; grayish brown (10YR 5/2) loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

2BC—31 to 38 inches; dark yellowish brown (10YR 3/4) sand; common fine faint strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; very friable; few fine roots; few faint brown (7.5YR 4/2) clay films bridging sand grains; neutral; gradual smooth boundary.

2C—38 to 60 inches; dark yellowish brown (10YR 3/4) sand; common medium faint brown (10YR 5/3) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 28 to 40 inches. The mollic epipedon ranges from 10 to 15 inches in thickness.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons have an AB or BA horizon. The Bt horizon has value of 4 to 6 and chroma of 2 to 4. The 2BC horizon is sand, loamy sand, or sandy loam. The 2C horizon has value of 3 to 6 and chroma of 3 or 4. It is sand, fine sand, loamy sand, or loamy fine sand.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Lawson soils are similar to Otter and Radford soils. Otter soils are poorly drained. Radford soils are not cumulic and have a dark buried soil within a depth of 40 inches.

Typical pedon of Lawson silt loam, 1,040 feet east and 318 feet south of the northwest corner of sec. 17, T. 17 N., R. 9 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; few fine roots; neutral; clear smooth boundary.

A1—11 to 19 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; few fine roots; neutral; gradual smooth boundary.

A2—19 to 28 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few fine roots; neutral; gradual smooth boundary.

C1—28 to 50 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; few fine roots; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; very dark grayish brown (10YR 3/2) krotovinas; neutral; gradual smooth boundary.

C2—50 to 60 inches; grayish brown (2.5Y 5/2) silt loam; common fine faint dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; very dark grayish brown (10YR 3/2) krotovinas; neutral.

The thickness of the mollic epipedon ranges from 27 to 36 inches and corresponds to the thickness of the solum. The C horizon has chroma of 2 or 3. It has subhorizons of loam or sandy loam in the lower part of some pedons.

Lena Series

The Lena series consists of very poorly drained, moderately rapidly permeable soils on outwash plains and moraines. These soils formed in herbaceous deposits more than 51 inches thick. Slope is less than 2 percent.

Lena soils are similar to Aurelius, Edwards, Houghton, and Wallkill soils. Aurelius soils formed in less than 16 inches of organic material and in the underlying marl and sandy material. Edwards soils formed in organic material underlain by coprogenous earth and marl. Houghton soils do not have carbonates. Wallkill soils formed in 16 to 40 inches of mineral material and in the underlying organic material.

Typical pedon of Lena silt loam, overwash, in a cultivated field, 706 feet south and 1,056 feet east of the northwest corner of sec. 8, T. 16 N., R. 7 E.

Ap—0 to 9 inches; black (N 2/0) silt loam, black (10YR 2/1) dry; moderate fine granular structure; friable; common medium roots; few snail shell fragments; violent effervescence; mildly alkaline; abrupt smooth boundary.

A—9 to 14 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; few fine roots; common snail shell fragments; violent effervescence; mildly alkaline; abrupt smooth boundary.

Oa1—14 to 20 inches; sapric material, black (N 2/0) rubbed; about 2 percent fiber, less than 1 percent rubbed; weak thin platy structure; friable; few fine roots; few snail shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

Oa2—20 to 37 inches; sapric material, black (10YR 2/1) rubbed; about 15 percent fiber, 3 percent rubbed; weak thin platy structure; friable; many snail shell fragments; violent effervescence; mildly alkaline; clear smooth boundary.

Oa3—37 to 60 inches; sapric material, black (N 2/0) rubbed; about 15 percent fiber, 3 percent rubbed; massive; friable; common snail shell fragments; violent effervescence; mildly alkaline.

The thickness of the overwash ranges from 6 to 16 inches. The calcareous sapric material is more than 51 inches thick. Some pedons contain woody fragments, which cannot be crushed between the fingers.

Lenzburg Series

The Lenzburg series consists of well drained, moderately slowly permeable soils that formed in regolith derived from surface mining. The regolith is a mixture of fine-earth material and fragments of bedrock. Slope ranges from 4 to 70 percent.

Typical pedon of Lenzburg silty clay loam, 30 to 60 percent slopes, stony, 280 feet west and 400 feet north of the southeast corner of sec. 22, T. 16 N., R. 6 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common very fine, fine, and medium roots; approximately 1 percent fragments of shale; mildly alkaline; clear smooth boundary.

C1—3 to 14 inches; pale olive (5Y 6/3) and gray (5Y 6/1) silty clay loam; massive; firm; many very fine and fine, common medium, and few coarse roots; approximately 7 percent fragments of shale; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—14 to 24 inches; pale olive (5Y 6/3) channery silty clay loam; few fine faint gray (5Y 6/1) and common fine distinct light olive brown (2.5Y 5/6) mottles; massive; firm; many very fine and common fine roots; approximately 20 percent fragments of shale; slight effervescence; mildly alkaline; clear wavy boundary.

C3—24 to 60 inches; brown (10YR 5/3) very channery clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; common very fine, fine, and medium roots; approximately 60 percent fragments of shale; slight effervescence; mildly alkaline.

The rock fragments are commonly shale and siltstone, but some are sandstone and limestone. The A1 or Ap horizon has value of 4 or 5 and chroma of 1 or 2. The C horizon has value of 4 to 6 and chroma of 2 to 6. It is loam, silt loam, clay loam, silty clay loam, or the channery, very channery, stony, or very stony analogs of those textures.

Lisbon Series

The Lisbon series consists of somewhat poorly drained soils on moraines. These soils formed in loess and in the underlying loamy glacial till. Permeability is moderate in the solum and moderately slow in the substratum. Slope ranges from 0 to 2 percent.

Lisbon soils are similar to Brenton, Elburn, Flanagan, Joy, and Muscatine soils. Brenton and Elburn soils formed in loess and glacial outwash. Flanagan soils formed in a mantle of loess that is deeper over glacial till than that of the Lisbon soils. Joy and Muscatine soils formed entirely in loess.

Typical pedon of Lisbon silt loam, 1,220 feet south and 1,176 feet east of the northwest corner of sec. 32, T. 18 N., R. 8 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A—10 to 13 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—13 to 18 inches; brown (10YR 5/3) silty clay loam, few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; many very dark brown (10YR 2/2) organic coatings and common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—18 to 25 inches; brown (10YR 5/3) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; few fine roots; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt3—25 to 32 inches; brown (10YR 5/3) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct dark grayish brown (10YR 4/2) clay films on vertical faces of prisms; few fine roots;

common moderately thick dark grayish brown (10YR 4/2) clay films on faces of peds; few medium rounded dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

2Bt4—32 to 36 inches; brown (7.5YR 5/4) clay loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint brown (7.5YR 5/2) mottles; weak medium prismatic structure; friable; few medium rounded dark concretions of iron and manganese oxide; few pebbles; mildly alkaline; clear smooth boundary.

2C—36 to 60 inches; brown (7.5YR 5/4) loam; common medium distinct strong brown (7.5YR 5/6) and few fine faint brown (7.5YR 5/2) mottles; massive; firm; few pebbles; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 30 to 42 inches and is commonly the same as the depth to carbonates. The mollic epipedon ranges from 12 to 18 inches in thickness.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. The 2Bt horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 5. It is clay loam or loam. The 2C horizon is dominantly loam, but the range includes silt loam.

Marseilles Series

The Marseilles series consists of moderately deep, well drained and moderately well drained soils in the uplands. These soils formed in loess and in material weathered from noncalcareous shale. Permeability is moderate in the loess and slow in the residuum. Slope ranges from 2 to 60 percent.

Marseilles soils are similar to Birkbeck, Camden, Dodge, Fayette, Rozetta, St. Charles, and Sylvan soils. The similar soils do not have weathered bedrock within a depth of 60 inches. Birkbeck and Dodge soils formed in loess and glacial till. Camden and St. Charles soils formed in loess and glacial outwash. Fayette, Rozetta, and St. Charles soils formed entirely in loess.

Typical pedon of Marseilles silt loam, 30 to 60 percent slopes, 2,200 feet west and 1,180 feet south of the northeast corner of sec. 14, T. 15 N., R. 8 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many very fine and few fine roots; slightly acid; abrupt smooth boundary.

E—4 to 9 inches; yellowish brown (10YR 5/4) silt loam; moderate medium platy structure; friable; many very fine roots; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; many very fine and few fine roots; common distinct light gray (10YR 7/2 dry) silt coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—15 to 24 inches; brown (10YR 5/3) silty clay loam; strong fine and medium subangular blocky structure; friable; many very fine and few fine roots; few distinct light gray (10YR 7/2 dry) silt coatings and many distinct dark brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

2Bt3—24 to 36 inches; grayish brown (2.5Y 5/2) and olive gray (5Y 5/2) silty clay loam; few medium prominent yellowish red (5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine and few medium roots; many prominent dark brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; slightly acid; gradual wavy boundary.

2Cr1—36 to 51 inches; olive gray (5Y 5/2), soft silty clay loam shale; few medium prominent yellowish red (5YR 5/8) mottles; firm; common very fine and few fine roots; common prominent dark brown (10YR 4/3) clay films on shale fragments; few fine soft accumulations of iron and manganese oxide; slightly acid; gradual wavy boundary.

2Cr2—51 to 60 inches; olive (5Y 5/3) silty clay loam shale; very firm; few very fine roots; few prominent dark brown (10YR 4/3) clay films on shale fragments; few fine soft accumulations of iron and manganese oxide; neutral.

The thickness of the solum and the depth to soft shale bedrock range from 20 to 40 inches. The loess ranges from 15 to 30 inches in thickness.

The A or Ap horizon has value and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is silty clay loam or silt loam. The 2Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam, silty clay, or clay. The 2Cr horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 4. It is clay loam, silty clay loam, clay loam, or clay.

Marseilles silt loam, 2 to 5 percent slopes, eroded, and Marseilles silt loam, 5 to 10 percent slopes, eroded, are taxadjuncts because they have a thicker dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Martinsville Series

The Martinsville series consists of well drained soils on stream terraces. These soils formed in a thin layer of loess and in the underlying stratified, loamy sediments. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the lower part. Slope ranges from 1 to 5 percent.

Martinsville soils are similar to Camden, Hickory, and Miami soils. Camden soils have a mantle of loess that is deeper over outwash than that of the Martinsville soils. Hickory and Miami soils formed in glacial till.

Typical pedon of Martinsville silt loam, 1 to 5 percent slopes, 2,040 feet west and 740 feet south of the northeast corner of sec. 32, T. 16 N., R. 10 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common very fine roots; few small pebbles; medium acid; abrupt smooth boundary.

E—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common very fine roots; few small pebbles; slightly acid; clear smooth boundary.

2Bt1—11 to 18 inches; yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; firm; common very fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; few small pebbles; slightly acid; clear smooth boundary.

2Bt2—18 to 28 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common very fine roots; many distinct dark yellowish brown (10YR 4/4) clay films and few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine soft accumulations of iron and manganese oxide; few small pebbles; medium acid; clear smooth boundary.

2Bt3—28 to 36 inches; brown (10YR 5/3) clay loam; moderate medium subangular blocky structure; firm; few very fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; few small pebbles; medium acid; clear smooth boundary.

2Bt4—36 to 45 inches; brown (7.5YR 5/4) clay loam; common fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; few very fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; few small pebbles; slightly acid; clear smooth boundary.

2BC—45 to 54 inches; brown (7.5YR 5/4), stratified loam and sandy loam; common fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; few fine soft accumulations of iron and manganese oxide; few small pebbles; neutral; clear smooth boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; friable; few very fine roots; few small pebbles; neutral.

The thickness of the solum ranges from 50 to 60 inches. The loess is less than 15 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E and 2Bt horizons have value of 4 or 5 and chroma of 3 or 4. The E horizon is silt loam or loam. The 2Bt horizon is clay loam, silt loam, silty clay loam, loam, sandy loam, or sandy clay loam. The C horizon has value of 4 to 6 and chroma of 2 to 4. In some pedons it is stratified loam to sand.

Miami Series

The Miami series consists of well drained soils on till plains and moraines. These soils formed in as much as 18 inches of loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slope ranges from 5 to 35 percent.

Miami soils are similar to Dodge, Hennepin, Hickory, and Martinsville soils. Dodge soils formed in a mantle of loess that is thicker than that of the Miami soils. Hennepin soils have carbonates within a depth of 16 inches. They do not have an argillic horizon. Hickory soils do not have carbonates within a depth of 40 inches. Martinsville soils formed mainly in glacial outwash.

Typical pedon of Miami silt loam, 10 to 18 percent slopes, eroded, 860 feet west and 1,300 feet south of the northeast corner of sec. 21, T. 15 N., R. 8 E.

Ap—0 to 6 inches; mixed dark brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; moderate fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—6 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—15 to 28 inches; brown (7.5YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few small pebbles; few fine rounded dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

2BC—28 to 34 inches; brown (7.5YR 5/4) loam; weak coarse prismatic structure; firm; few fine roots; common faint dark brown (7.5YR 4/4) clay films on faces of peds; few small pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

2C—34 to 60 inches; brown (7.5YR 5/4) loam; massive; firm; few small pebbles; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 28 to 40 inches. The thickness of the loess ranges from 6 to 18 inches.

The Ap or A horizon has value of 3 to 5 and chroma of 1 to 4. The dark surface layer is less than 5 inches thick. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam or clay loam.

Minneiska Series

The Minneiska series consists of deep, moderately well drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy, calcareous alluvium. Slope ranges from 0 to 2 percent.

Minneiska soils are similar to Landes soils. Landes soils have a mollic epipedon and a cambic horizon and do not have carbonates within a depth of 40 inches.

Typical pedon of Minneiska loam, occasionally flooded, 112 feet north and 2,356 feet west of the southeast corner of sec. 8, T. 15 N., R. 9 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—8 to 21 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; thin strata of dark brown (10YR 4/3) and very dark gray (10YR 3/1) very fine sand and silt loam; weak medium granular structure; friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—21 to 25 inches; very dark grayish brown (10YR 3/2) loam; thin strata of dark brown (10YR 4/3) sand; weak medium granular structure; very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C3—25 to 46 inches; very dark grayish brown (10YR 3/2) loam; thin strata of dark brown (10YR 4/3) sand; massive; very friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

C4—46 to 60 inches; dark brown (10YR 4/3), stratified silt loam, loam, and sand; massive and friable in the loamy strata; single grain and loose in the sandy strata; few pebbles; violent effervescence; moderately alkaline.

The Ap horizon is 7 or 8 inches thick. The C horizon has hue of 10YR or 2.5Y and value of 2 to 5. It is stratified silt loam, loam, sandy loam, fine sandy loam, loamy fine sand, loamy sand, very fine sand, or sand.

Moundprairie Series

The Moundprairie series consists of poorly drained and very poorly drained, moderately permeable soils that formed in recent alluvium on flood plains. Slope is 0 to 1 percent.

Moundprairie soils are similar to Otter soils. Otter soils are cumulic and do not have carbonates within a depth of 40 inches.

Typical pedon of Moundprairie silty clay loam, wet, 1,540 feet north and 2,500 feet west of the southeast corner of sec. 20, T. 15 N., R. 10 E.

A—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common very fine roots; slight effervescence; mildly alkaline; gradual smooth boundary.

Cg1—9 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; thin strata of dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure parting to moderate medium granular; friable; common very fine roots; slight effervescence; mildly alkaline; gradual smooth boundary.

Cg2—15 to 27 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; thin strata of dark grayish brown (10YR 4/2) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky and moderate medium granular structure; friable; common very fine and fine roots; slight effervescence; mildly alkaline; gradual smooth boundary.

Cg3—27 to 37 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; thin strata of dark grayish brown (10YR 4/2) silt loam; few fine distinct grayish brown (10YR 5/2) and common medium distinct dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; friable; few very fine roots; slight effervescence; moderately alkaline; gradual smooth boundary.

Cg4—37 to 49 inches; stratified very dark grayish brown (2.5Y 3/2) silt loam and dark grayish brown (10YR 4/2) loam; few fine distinct grayish brown (10YR 5/2) and common medium distinct dark brown (7.5YR 4/4) mottles; massive; friable; slight effervescence; mildly alkaline; gradual smooth boundary.

Cg5—49 to 60 inches; very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2), stratified silt loam, loam, and loamy sand; few fine distinct grayish brown (10YR 5/2) and common medium distinct dark brown (7.5YR 4/4) mottles; massive; friable; slight effervescence; mildly alkaline.

The thickness of the A horizon ranges from 7 to 10 inches and is the same as the thickness of the solum. This horizon has value of 2 or 3. The Cg horizon has value of 2 to 5. It dominantly is silty clay loam or silt loam, but thin lighter colored strata have textures ranging from silt to sand. Some pedons have an Ab horizon.

Muscatine Series

The Muscatine series consists of somewhat poorly drained, moderately permeable soils on broad ridges and in broad, low areas in the uplands. These soils formed in loess. Slope ranges from 0 to 2 percent.

The Muscatine soils in this county are taxadjuncts because they have an argillic horizon, which is not definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Muscatine soils are similar to Atterberry, Brenton, Elburn, Flanagan, Joy, and Lisbon soils. Atterberry soils have a dark surface soil that is thinner than that of the Muscatine soils. Brenton and Elburn soils formed in loess and glacial outwash. Flanagan and Lisbon soils formed in loess and glacial till. Joy soils have a lower content of clay in the subsoil than the Muscatine soils.

Typical pedon of Muscatine silt loam, 282 feet south and 1,080 feet east of the northwest corner of sec. 12, T. 16 N., R. 8 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—9 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—15 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—21 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bt3—30 to 45 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; few fine roots; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

C—45 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the solum ranges from 40 to 48 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bt horizon has value of 3 to 6 and chroma of 2 or 3. The C horizon has value of 5 or 6.

Oakville Series

The Oakville series consists of well drained, rapidly permeable soils on outwash plains and moraines. These soils formed in sandy eolian material. Slope ranges from 1 to 20 percent.

Oakville soils are similar to Chute soils. Chute soils have carbonates throughout.

Typical pedon of Oakville fine sand, 7 to 20 percent slopes, 716 feet south and 1,056 feet east of the northwest corner of sec. 18, T. 17 N., R. 6 E.

A—0 to 5 inches; dark brown (10YR 4/3) fine sand, yellowish brown (10YR 5/4) dry; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

Bw—5 to 23 inches; strong brown (7.5YR 5/6) fine sand; weak medium subangular blocky structure;

very friable; few fine roots; neutral; clear smooth boundary.

BC—23 to 36 inches; yellowish brown (10YR 5/6) fine sand; very weak medium subangular blocky structure; very friable; few fine roots; neutral; clear smooth boundary.

C—36 to 60 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 22 to 40 inches. The Ap horizon has value of 2 to 4 and chroma of 1 to 4. The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is fine sand, loamy sand, or sand. The C horizon is fine sand or sand.

Orio Series

The Orio series consists of poorly drained soils in depressions on outwash plains. These soils formed in loamy sediments and in the underlying sandy outwash. Permeability is moderately slow in the upper part of the profile and rapid in the lower part. Slope ranges from 0 to 2 percent.

Orio soils are similar to Selma and Udolpho soils. Selma soils do not have an argillic horizon and have a mollic epipedon. Udolpho soils have a sandy texture within a depth of 40 inches.

Typical pedon of Orio loam, 1,480 feet west and 468 feet north of the southeast corner of sec. 3, T. 18 N., R. 6 E.

Ap—0 to 9 inches; black (10YR 2/1) loam mixed with dark gray (10YR 4/1) E material; dark grayish brown (10YR 4/2) dry; moderate very fine and fine granular structure; friable; common very fine roots; strongly acid; abrupt smooth boundary.

Eg1—9 to 16 inches; dark gray (10YR 4/1) loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate fine granular; friable; few very fine roots; very few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Eg2—16 to 22 inches; dark gray (10YR 4/1) loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak thick platy structure parting to moderate fine subangular blocky; friable; few very fine roots; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; common fine soft accumulations of iron oxide; slightly acid; clear smooth boundary.

Btg1—22 to 28 inches; gray (10YR 5/1) clay loam; common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; friable; few very fine roots; many faint dark gray (10YR 4/1) clay films on faces of peds; few fine soft accumulations of iron oxide; slightly acid; abrupt smooth boundary.

Btg2—28 to 34 inches; gray (10YR 5/1) clay loam; common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few very fine roots; common faint dark gray (10YR 4/1) clay films on faces of peds; few fine soft accumulations of iron oxide; slightly acid; clear smooth boundary.

2BCg—34 to 40 inches; gray (10YR 5/1) sandy loam; common fine and medium prominent strong brown (7.5YR 4/6) mottles; weak coarse prismatic structure; very friable; few very fine roots; few faint dark gray (10YR 4/1) clay films on faces of peds; common medium soft accumulations of iron oxide; neutral; clear smooth boundary.

2Cg—40 to 60 inches; grayish brown (10YR 5/2) sand; few fine distinct dark yellowish brown (10YR 4/6) mottles; single grain; loose; few fine soft accumulations of iron oxide; neutral.

The thickness of the solum ranges from 35 to 48 inches. The Eg horizon has value of 4 to 6 and chroma of 1 or 2. The Btg horizon is loam, silt loam, sandy loam, or clay loam. The 2Cg horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 2 or 3. It is sand or loamy sand.

Otter Series

The Otter series consists of poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Otter soils are similar to Lawson and Moundprairie soils. Lawson soils are somewhat poorly drained. Moundprairie soils are not cumulic and have carbonates throughout.

Typical pedon of Otter silt loam, 540 feet south and 1,496 feet west of the northeast corner of sec. 4, T. 17 N., R. 9 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A1—9 to 23 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; few fine roots;

neutral; clear smooth boundary.

A2—23 to 29 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

A3—29 to 36 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; mildly alkaline; clear smooth boundary.

Bg—36 to 46 inches; light brownish gray (2.5Y 6/2) silt loam; few fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; common distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; black (10YR 2/1) krotovinas; mildly alkaline; clear smooth boundary.

Cg—46 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct grayish brown (2.5Y 5/2) mottles; massive; friable; common fine dark concretions of iron and manganese oxide; mildly alkaline.

The thickness of the mollic epipedon ranges from 24 to 50 inches. The solum ranges from 30 to 50 inches in thickness.

The Ap and A horizons have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2. They are commonly silt loam, but some subhorizons are silty clay loam. Some pedons have strata of loam or sandy loam below a depth of 35 inches. Some do not have a Bg horizon. A buried soil is within a depth of 60 inches in some pedons. The Cg horizon has value of 4 to 6. It has strata of loam, clay loam, silty clay loam, or sandy loam in some pedons.

Parr Series

The Parr series consists of well drained soils on moraines. These soils formed in a thin layer of loess and in the underlying glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slope ranges from 2 to 10 percent.

The Parr soils in this county are taxadjuncts because they have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Parr soils are similar to Jasper, La Rose, and Saybrook soils. Jasper soils formed in glacial outwash. La Rose soils have a solum that is thinner than that of the Parr soils. They have carbonates within a depth of 24 inches. Saybrook soils formed in a mantle of loess that is deeper than that of the Parr soils.

Typical pedon of Parr silt loam, 5 to 10 percent slopes, eroded, 276 feet south and 2,146 feet east of the northwest corner of sec. 11, T. 16 N., R. 7 E.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2) and yellowish brown (10YR 4/4) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; friable; common fine roots; many distinct brown (10YR 4/3) clay films and few distinct dark brown (10YR 3/3) organic coatings on faces of peds; few pebbles; slightly acid; clear smooth boundary.

Bt2—16 to 26 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; few pebbles; neutral; clear smooth boundary.

BC—26 to 34 inches; brown (7.5YR 5/4) loam; weak medium subangular blocky structure; friable; few fine roots; few distinct brown (7.5YR 4/4) clay films on faces of peds; few pebbles; slight effervescence; mildly alkaline; gradual smooth boundary.

C—34 to 60 inches; brown (7.5YR 5/4) loam; massive; friable; few fine roots; few pebbles; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 28 to 40 inches. The Ap horizon has chroma of 2 or 3. The Bt horizon has chroma of 4 to 6. It is silty clay loam in the upper part in some pedons.

Pella Series

The Pella series consists of poorly drained, moderately permeable soils on outwash plains. These soils formed in silty material underlain by stratified, loamy outwash. Slope ranges from 0 to 2 percent.

Pella soils are similar to Drummer, Harpster, Hartsburg, Prophetstown, and Sable soils. Drummer and Sable soils do not have carbonates within a depth of 40 inches. Harpster and Prophetstown soils have carbonates within a depth of 16 inches. Hartsburg soils formed entirely in loess.

Typical pedon of Pella silty clay loam, 320 feet east and 1,820 feet south of the northwest corner of sec. 30, T. 17 N., R. 6 E.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A1—8 to 18 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; moderate medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

A2—18 to 23 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; few fine prominent dark brown (10YR 4/3) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; few snail shells; neutral; clear smooth boundary.

Bg1—23 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish red (5YR 5/8) and few fine prominent strong brown (7.5YR 5/6) and distinct dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure; friable; few fine roots; black (N 2/0) krotovinas at a depth of 26 to 31 inches; few snail shells; neutral; clear smooth boundary.

Bg2—35 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish red (5YR 5/8) and few fine distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common snail shells; strong effervescence; mildly alkaline; clear smooth boundary.

2BCg—46 to 50 inches; grayish brown (2.5Y 5/2), stratified silt loam and loam; common medium prominent yellowish red (5YR 5/8) mottles; weak medium prismatic structure; friable; common snail shells; strong effervescence; mildly alkaline; clear smooth boundary.

2Cg—50 to 60 inches; dark grayish brown (2.5Y 4/2), stratified silt loam and sandy loam; common medium prominent yellowish red (5YR 5/8) mottles; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 32 to 50 inches. The depth to free carbonates ranges from 18 to 40 inches. The mollic epipedon ranges from 15 to 20 inches in thickness. The 2BCg and 2C horizons are stratified silt loam, loam, sandy loam, or loamy sand.

Plano Series

The Plano series consists of well drained, moderately permeable soils on outwash plains, moraines, and stream terraces. These soils formed in 40 to 60 inches of loess and in stratified, loamy outwash. Slope ranges from 0 to 10 percent.

Plano soils are similar to Assumption, Batavia, Catlin, Downs, Elkhart, Saybrook, Tama, and Waupecan soils. Assumption, Catlin, and Saybrook soils formed in loess and glacial till. Batavia soils have a dark surface soil that is thinner than that of the Plano soils. Downs, Elkhart, and Tama soils formed entirely in loess. Waupecan soils have sandy material within a depth of 40 inches.

Typical pedon of Plano silt loam, 0 to 2 percent slopes, 1,122 feet north and 1,782 feet east of the southwest corner of sec. 31, T. 15 N., R. 8 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—10 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—16 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—19 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) and few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—27 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—35 to 42 inches; brown (10YR 5/3) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) relict mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; common medium rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt5—42 to 56 inches; brown (10YR 5/3) silt loam; common fine distinct light brownish gray (10YR 6/2) and many fine distinct yellowish brown (10YR 5/6) relict mottles; weak medium subangular blocky structure; friable; few fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; common medium rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

2BC—56 to 60 inches; brown (10YR 5/3) and dark yellowish brown (10YR 4/4), stratified silt loam, loam, and sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; very weak medium subangular blocky structure; friable; common medium rounded dark accumulations of iron and manganese oxide; about 7 percent small pebbles; mildly alkaline.

The thickness of the solum ranges from 44 to more than 70 inches. The depth to free carbonates is typically more than 60 inches. The mollic epipedon ranges from 12 to 17 inches in thickness.

The 2BC horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is stratified silt loam, loam, sandy loam, clay loam, or sandy clay loam. Some pedons have a 2C horizon.

Plano silt loam, 2 to 5 percent slopes, eroded, and Plano silt loam, 5 to 10 percent slopes, eroded, are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Port Byron Series

The Port Byron series consists of moderately well drained and well drained soils on loess-covered uplands. These soils formed in loess. They are moderately permeable in the part of the profile that formed in loess and rapidly permeable in the lower part of a sandy substratum phase. Slope ranges from 2 to 10 percent.

Port Byron soils are similar to Waukegan soils. Waukegan soils have sandy material within a depth of 40 inches.

Typical pedon of Port Byron silt loam, 2 to 5 percent slopes, 156 feet north and 1,560 feet west of the southeast corner of sec. 17, T. 17 N., R. 8 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark brown (10YR 4/3) dry; moderate medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

AB—9 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bw1—14 to 20 inches; dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—20 to 28 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; many faint dark brown (10YR 4/3) coatings on faces of peds; medium acid; clear smooth boundary.

Bw3—28 to 36 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many faint dark brown (10YR 4/3) coatings on faces of peds; medium acid; clear smooth boundary.

Bw4—36 to 43 inches; yellowish brown (10YR 5/4) silt loam; common medium faint brown (10YR 5/3) and common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many faint dark brown (10YR 4/3) coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

BC—43 to 60 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct strong brown (7.5YR 5/6) and common medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common faint dark brown (10YR 4/3) coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 48 to more than 60 inches. The dark surface layer ranges from 8 to 16 inches in thickness.

The Ap horizon has chroma of 1 to 3. The Bw horizon has chroma of 4 to 6. Some pedons have a C horizon within a depth of 60 inches. This horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6. It is silt loam. The 2C horizon in the sandy substratum phase is sand or loamy sand.

Port Byron silt loam, 2 to 5 percent slopes, eroded, and Port Byron silt loam, 5 to 10 percent slopes, eroded, are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Prophetstown Series

The Prophetstown series consists of poorly drained, moderately permeable soils on outwash plains. These soils formed in calcareous, silty material. Slope ranges from 0 to 2 percent.

Prophetstown soils are similar to Harpster, Hartsburg, and Pella soils. Harpster soils have a higher content of clay in the control section than the Prophetstown soils.

Hartsburg and Pella soils do not have carbonates within a depth of 20 inches.

Typical pedon of Prophetstown silt loam, 500 feet south and 306 feet west of the northeast corner of sec. 5, T. 18 N., R. 6 E.

Akp—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; few snail shell fragments; violent effervescence; moderately alkaline; abrupt smooth boundary.

Ak—8 to 13 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure parting to moderate medium granular; friable; common fine roots; few snail shell fragments; violent effervescence; moderately alkaline; clear smooth boundary.

Bg1—13 to 19 inches; dark gray (10YR 4/1) silt loam; moderate medium subangular blocky structure; few fine roots; friable; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds; strong effervescence; mildly alkaline; clear smooth boundary.

Bg2—19 to 23 inches; dark grayish brown (2.5Y 4/2) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct very dark grayish brown (2.5Y 3/2) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

BCg—23 to 29 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; few fine roots; few distinct grayish brown (2.5Y 5/2) clay films on faces of peds; dark gray (10YR 4/1) krotovinas; slight effervescence; mildly alkaline; clear smooth boundary.

Cg1—29 to 48 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline; clear smooth boundary.

2Cg2—48 to 60 inches; dark grayish brown (2.5Y 4/2), stratified loam and sand; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; weak effervescence; mildly alkaline.

The thickness of the solum ranges from 28 to 40 inches. The mollic epipedon ranges from 10 to 15 inches in thickness.

The Akp or A horizon has value of 2 or 3. The Bg horizon has value of 4 to 6. The Cg and 2Cg horizons have hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 to 6.

Radford Series

The Radford series consists of somewhat poorly drained, moderately permeable soils on flood plains and in narrow drainageways. These soils formed in silty alluvium that overlies a buried soil. Slope ranges from 0 to 2 percent.

Radford soils are similar to Lawson soils. Lawson soils have a mollic epipedon that is thicker than that of the Radford soils. They do not have a buried soil within a depth of 40 inches.

Typical pedon of Radford silt loam, 1,109 feet west and 1,254 feet south of the northeast corner of sec. 23, T. 17 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—9 to 21 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; few fine dark accumulations of iron and manganese oxide; slightly acid; gradual smooth boundary.

C—21 to 29 inches; stratified very dark gray (10YR 3/1) silt loam and brown (10YR 5/3) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; common fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Ab1—29 to 36 inches; black (10YR 2/1) silty clay loam; few medium faint very dark grayish brown (10YR 3/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; few very fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Ab2—36 to 43 inches; black (10YR 2/1) silty clay loam; few fine faint very dark grayish brown (10YR 3/2) mottles; weak medium subangular blocky structure; friable; few very fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bgb—43 to 60 inches; black (10YR 2/1) silty clay loam; few fine faint dark gray (10YR 4/1) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few very fine dark accumulations of iron and manganese oxide; neutral.

Depth to the buried soil ranges from 20 to 40 inches. The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The C horizon also has value of 2 or 3 and chroma of 1 or 2. The Ab horizon is silt loam, silty clay loam, clay loam, or loam.

Rodman Series

The Rodman series consists of excessively drained soils on eskers, moraines, stream terrace breaks, and outwash plains. These soils formed in calcareous, stratified sand and gravel. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. Slope ranges from 2 to 15 percent.

Rodman soils are similar to Casco and Hononegah soils. Casco and Hononegah soils have a lower content of gravel than the Rodman soils.

Typical pedon of Rodman gravelly sandy loam, 7 to 15 percent slopes, 400 feet west and 1,050 feet north of the southeast corner of sec. 6, T. 18 N., R. 8 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; few fine roots; about 15 percent gravel; neutral; abrupt smooth boundary.

Bw—7 to 14 inches; dark brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; common distinct dark brown (7.5YR 3/2) organic coatings on faces of peds; about 25 percent gravel; neutral; clear smooth boundary.

C1—14 to 18 inches; dark brown (7.5YR 4/4) gravelly loamy sand; single grain; friable; about 25 percent gravel; neutral; clear smooth boundary.

C2—18 to 25 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; about 40 percent gravel; strong effervescence; mildly alkaline; clear smooth boundary.

C3—25 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; about 45 percent gravel; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 15 inches. The mollic epipedon ranges from 6 to 10 inches in thickness. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2.

Ross Series

The Ross series consists of 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. Slope ranges from 0 to 2 percent.

Ross soils are similar to Landes soils. Landes soils have less clay and more sand than the Ross soils.

Typical pedon of Ross silt loam, 2,620 feet north and 960 feet east of the southwest corner of sec. 17, T. 15 N., R. 9 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate fine granular structure; friable; common fine roots; mildly alkaline; abrupt smooth boundary.

A—8 to 20 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate fine subangular blocky structure; friable; common fine roots; mildly alkaline; clear smooth boundary.

Bw1—20 to 29 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate medium subangular blocky structure; friable; few fine roots; mildly alkaline; clear smooth boundary.

Bw2—29 to 36 inches; dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

BC—36 to 47 inches; dark brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; few distinct dark brown (10YR 3/3) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

C—47 to 60 inches; dark yellowish brown (10YR 4/4), stratified loamy sand and sandy loam; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 36 to 50 inches. The mollic epipedon ranges from 24 to 29 inches in thickness.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. They are dominantly silt loam, but the range includes loam and fine sandy loam. The part of the Bw horizon below the mollic epipedon has value of 4 or 5 and chroma of 3 to 5. This horizon is loam, silt loam, or sandy loam. The C horizon has value of 4 or 5 and chroma of 4 to 6. It is fine sandy loam or loam in the upper part and ranges to sand in the lower part.

Rozetta Series

The Rozetta series consists of moderately well drained, moderately permeable soils on loess-covered uplands. These soils formed in loess. Slope ranges from 0 to 5 percent.

Rozetta soils are similar to Birkbeck, Camden, Dodge, Downs, Fayette, Marseilles, St. Charles, and Sylvan soils. Birkbeck and Dodge soils formed in loess and glacial till. Camden and St. Charles soils formed in loess and glacial outwash. Downs soils have a surface layer that is darker than that of the Rozetta soils. Fayette and Sylvan soils are well drained. Marseilles soils formed in loess and material weathered from shale.

Typical pedon of Rozetta silt loam, 2 to 5 percent slopes, 2,218 feet north and 2,574 feet west of the southeast corner of sec. 13, T. 15 N., R. 8 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate thin platy structure; friable; few fine roots; medium acid; clear smooth boundary.

Bt1—13 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few fine roots; few distinct dark brown (10YR 4/3) clay films and few distinct brown (10YR 5/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium distinct strong brown (7.5YR 5/8) mottles; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films and few distinct brown (10YR 5/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt3—26 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium distinct strong brown (7.5YR 5/8) and few medium prominent light brownish gray (2.5Y 6/2) mottles; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films and few distinct brown (10YR 5/3) silt coatings on faces of peds; few medium rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—37 to 49 inches; yellowish brown (10YR 5/4) silty clay loam; few medium faint yellow brown (10YR 5/6) and few medium prominent light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; few medium rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt5—49 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; few medium faint yellowish brown (10YR 5/6) and common medium prominent light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; friable; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few medium rounded dark accumulations of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 50 to more than 60 inches. The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 2 or 3. The Bt horizon has chroma of 3 or 4.

Sable Series

The Sable series consists of poorly drained, moderately permeable soils in drainageways and depressions on loess-covered till plains and moraines. These soils formed in loess. Slope ranges from 0 to 2 percent.

Sable soils are similar to Drummer, Hartsburg, and Pella soils. Drummer and Pella soils formed in loess and glacial outwash. Hartsburg and Pella soils have carbonates within a depth of 40 inches.

Typical pedon of Sable silty clay loam, 858 feet east and 2,376 feet north of the southwest corner of sec. 20, T. 17 N., R. 9 E.

Ap—0 to 7 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—7 to 11 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

AB—11 to 17 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; common fine prominent dark grayish brown (2.5Y 4/2) mottles; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

Bg1—17 to 24 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; friable; few fine roots; few medium rounded dark concretions of iron and manganese oxide; black (N 2/0) krotovinas; neutral; clear smooth boundary.

Bg2—24 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/8) and common fine prominent dark gray (10YR 4/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; black (N 2/0) krotovinas; neutral; clear smooth boundary.

BCg—31 to 43 inches; grayish brown (2.5Y 5/2) silt loam; common fine prominent strong brown (7.5YR 5/8) and dark gray (10YR 4/1) mottles; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—43 to 60 inches; grayish brown (2.5Y 5/2) silt loam;

common medium prominent strong brown (7.5YR 5/8) and common fine prominent dark gray (10YR 4/1) mottles; massive; firm; few medium rounded dark concretions of iron and manganese oxide; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 45 inches. The thickness of the mollic epipedon ranges from 12 to 23 inches.

The Ap and A horizons are silty clay loam or silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. The Cg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2.

Saybrook Series

The Saybrook series consists of well drained, moderately permeable soils on moraines. These soils formed in loess and loamy glacial till. Slope ranges from 2 to 10 percent.

Saybrook soils are similar to Assumption, Catlin, Elkhart, Parr, Tama, and Waupecan soils. Assumption soils have a solum than is thicker than that of the Saybrook soils. Catlin soils formed in a mantle of loess that is deeper over glacial till than that of the Saybrook soils. Elkhart and Tama soils formed entirely in loess. Parr soils formed mainly in glacial till. Plano and Waupecan soils formed in loess and loamy or sandy outwash.

Typical pedon of Saybrook silt loam, 2 to 5 percent slopes, 260 feet west and 1,230 feet south of the northeast corner of sec. 9, T. 17 N., R. 7 E.

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

A—8 to 14 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—14 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct very dark brown (10YR 2/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—30 to 36 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; friable; few fine roots; few distinct dark brown (7.5YR 4/2) clay films on faces of peds; few pebbles; neutral; clear smooth boundary.

2C—36 to 60 inches; brown (7.5YR 5/4) loam; massive; friable; few fine rounded dark accumulations of iron and manganese oxide; few pebbles; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 30 to 40 inches. The thickness of the dark surface soil ranges from 8 to 14 inches.

The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is silty clay loam or silt loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2C horizon has hue of 10YR or 7.5YR.

Saybrook silt loam, 2 to 5 percent slopes, eroded, and Saybrook silt loam, 5 to 10 percent slopes, eroded, are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Selma Series

The Selma series consists of poorly drained soils on outwash plains. These soils formed in loamy material and stratified, coarse textured outwash. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slope ranges from 0 to 2 percent.

Selma soils are similar to Drummer, Gilford, and Orio soils. Drummer soils have less sand in the upper part than the Selma soils. Gilford soils have less clay in the upper part than the Selma soils. Orio soils do not have a mollic epipedon.

Typical pedon of Selma loam, occasionally flooded, 222 feet north and 1,436 east of the center of sec. 8, T. 18 N., R. 7 E.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A—10 to 15 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bg1—15 to 26 inches; grayish brown (2.5Y 5/2) loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few fine roots; common distinct black (10YR 2/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg2—26 to 37 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; friable; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) loamy krotovinas; neutral; clear smooth boundary.

BCg—37 to 47 inches; light brownish gray (2.5Y 6/2) fine sandy loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

Cg1—47 to 53 inches; grayish brown (2.5Y 5/2) sandy loam; single grain; loose; slight effervescence; mildly alkaline; clear smooth boundary.

Cg2—53 to 60 inches; pale brown (10YR 6/3) sand; thin strata of silt loam; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 38 to 50 inches. The thickness of the mollic epipedon ranges from 14 to 23 inches.

The Ap and A horizons have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 or 1. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is loam, silt loam, silty clay loam, or clay loam in the upper part and loam or fine sandy loam in the lower part. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 6. It is sand, loamy sand, sandy loam, loam, or silt loam.

Sparta Series

The Sparta series consists of excessively drained, rapidly permeable soils on dunes, outwash plains, and moraines. These soils formed in sandy eolian material. Slope ranges from 1 to 20 percent.

The Sparta soils in this county are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Sparta soils are similar to Dickinson and Hononegah soils. The somewhat excessively drained Dickinson soils have less sand in the control section than the Sparta soils. Hononegah soils have a higher content of gravel than the Sparta soils.

Typical pedon of Sparta sand, 7 to 20 percent slopes, eroded, 500 feet north and 1,816 feet east of the southwest corner of sec. 19, T. 18 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; common fine roots; strongly acid; abrupt smooth boundary.

Bw1—9 to 16 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium prismatic structure parting to medium subangular blocky; very friable; few fine roots; strongly acid; clear smooth boundary.

Bw2—16 to 31 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; few fine roots; strongly acid; clear smooth boundary.

C—31 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few strong brown (7.5YR 5/6) bands of iron oxide less than 1 inch thick below a depth of 43 inches; strongly acid.

The thickness of the solum ranges from 24 to 32 inches. The Ap horizon has value of 2 or 3. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. The C horizon has value of 4 to 6.

St. Charles Series

The St. Charles series consists of well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in 40 to 60 inches of loess and in the underlying glacial outwash. Slope ranges from 0 to 10 percent.

St. Charles soils are similar to Batavia, Birkbeck, Camden, Dodge, Fayette, Marseilles, Rozetta, and Sylvan soils. Batavia soils have a surface layer that is darker than that of the St. Charles soils. Birkbeck and Dodge soils formed in loess and glacial till. Camden soils have a mantle of loess that is deeper over glacial outwash than that of the St. Charles soils. Fayette, Rozetta, and Sylvan soils formed entirely in loess. Marseilles soils formed in loess and material weathered from shale.

Typical pedon of St. Charles silt loam, 2 to 5 percent slopes, 2,170 feet west and 80 feet north of the southeast corner of sec. 26, T. 16 N., R. 8 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many dark brown (10YR 3/3) organic coatings and many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—21 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—34 to 44 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many distinct dark yellowish brown (10YR 4/4) clay films and many distinct light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

2Bt5—44 to 50 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; many distinct dark yellowish brown (10YR 4/4) clay films and many distinct light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

2Bt6—50 to 57 inches; yellowish brown (10YR 5/6), stratified loam, sandy loam, and silt loam; weak medium subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2C—57 to 60 inches; yellowish brown (10YR 5/6), stratified loam and silt loam; massive; friable; medium acid.

The thickness of the solum ranges from 55 to more than 60 inches. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Pedons in uncultivated areas have an E horizon, which has value of 4 to 6 and chroma of 2 to 4. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. The 2Bt horizon has value of 4 or 5.

Stronghurst Series

The Stronghurst series consists of somewhat poorly drained, moderately permeable soils on loess-covered uplands. These soils formed in loess. Slope ranges from 0 to 2 percent.

Stronghurst soils are similar to Atterberry and Virgil soils. Atterberry and Virgil soils have a dark surface layer.

Typical pedon of Stronghurst silt loam, 582 feet south and 78 feet west of the northeast corner of sec. 23, T. 15 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; very friable; few fine roots; common fine black (5YR 2/1) accumulations of iron and manganese oxide; neutral; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 5/3) silt loam; common fine faint light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate thin and very thin platy structure; friable; few fine roots; common fine black (5YR 2/1) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt1—13 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct grayish brown (10YR 5/2) clay films and many distinct light gray (10YR 7/2 silt coatings on faces of peds; common fine black (5YR 2/1) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt2—24 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; common fine black (5YR 2/1) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt3—30 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/8), strong brown (7.5YR 5/6), and light brownish gray (2.5Y 6/2) mottles; moderate medium prismatic structure; friable; few fine roots; common distinct brown (10YR 5/2) clay films on faces of peds; common fine black (5YR 2/1) accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt4—38 to 47 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2, 2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; friable; few fine roots; few distinct brown (10YR 5/2) clay films on faces of peds; common fine dark (5YR 2/1) accumulations of iron and manganese oxide; strongly acid; gradual smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct strong brown (7.5YR

5/6) and light brownish gray (2.5Y 6/2) mottles; massive; friable; common fine black (5YR 2/1) accumulations of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 45 to 53 inches. Some pedons do not have an E horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4.

Sylvan Series

The Sylvan series consists of well drained, moderately permeable soils on side slopes in the uplands. These soils formed in loess or in loess and the underlying silty lacustrine sediments. Slope ranges from 10 to 60 percent.

Sylvan soils are similar to Birkbeck, Camden, Dodge, Fayette, Marseilles, Rozetta, and St. Charles soils. Birkbeck, Camden, Dodge, and St. Charles soils have more sand in the lower part than the Sylvan soils. Fayette and Rozetta soils have a solum that is thicker than that of the Sylvan soils. Marseilles soils formed in loess and material weathered from shale.

Typical pedon of Sylvan silt loam, 10 to 18 percent slopes, 140 feet east and 100 feet south of the center of sec. 34, T. 17 N., R. 8 E.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine granular structure; friable; many very fine and few fine roots; neutral; clear smooth boundary.

E—5 to 10 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure parting to moderate medium granular; friable; many very fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings and light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—10 to 15 inches; brown (10YR 4/3) silty clay loam; moderate fine and very fine subangular blocky structure; friable; common very fine roots; few distinct dark brown (10YR 3/3) clay films and very few distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt2—15 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; common very fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt3—21 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; few distinct dark yellowish brown (10YR 4/4) clay films and very few distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt4—27 to 35 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) relict mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; few prominent light gray (10YR 7/2) silt coatings and common faint dark brown (7.5YR 4/4) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

BC—35 to 40 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few very fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine dark accumulations and few medium dark concretions of iron and manganese oxide; few medium light colored concretions of calcium carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—40 to 54 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct brownish yellow (10YR 6/6) mottles; appears massive but has planes of weakness; friable; few fine dark accumulations of iron and manganese oxide; common coarse light colored concretions of calcium carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—54 to 60 inches; brownish yellow (10YR 6/6) silt loam; few medium prominent light brownish gray (10YR 6/2) mottles; massive; friable; few fine dark accumulations of iron and manganese oxide; violent effervescence; moderately alkaline.

The solum ranges from 22 to 40 inches in thickness. The depth to carbonates ranges from 18 to 35 inches. Some pedons do not have an E horizon.

Tama Series

The Tama series consists of moderately well drained, moderately permeable soils on loess-covered till plains and moraines. These soils formed in loess. Slope ranges from 0 to 10 percent.

Tama soils are similar to Assumption, Catlin, Downs, Elkhart, Plano, Saybrook, and Waupecan soils. Assumption, Catlin, Plano, Saybrook, and Waupecan soils have more sand in the lower part than the Tama soils. Downs soils have a dark surface soil that is thinner than that of the Tama soils. Elkhart soils have carbonates within a depth of 40 inches.

Typical pedon of Tama silt loam, 0 to 2 percent slopes, 260 feet west and 1,430 feet north of the southeast corner of sec. 35, T. 17 N., R. 8 E.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; few fine roots; many distinct black (10YR 2/1) organic coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—13 to 19 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—19 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—24 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt4—30 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and common medium distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; gradual smooth boundary.

BC—38 to 44 inches; yellowish brown (10YR 5/4) silt loam; common medium prominent grayish brown (2.5Y 5/2) and common medium distinct dark yellowish brown (10YR 4/6) and faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine rounded dark accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

C—44 to 60 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) silt loam; common fine distinct strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine rounded dark accumulations of iron and manganese oxide; neutral.

The thickness of the solum ranges from 36 inches to more than 60 inches. The Ap and A horizons have value of 2 or 3 and chroma of 1 to 3. They are silt loam or silty clay loam. The Bt horizon also is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

Tama silt loam, 2 to 5 percent slopes, eroded, Tama silt loam 5 to 10 percent slopes, eroded, and Tama silty clay loam, 5 to 10 percent slopes, severely eroded, are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Tell Series

The Tell series consists of well drained soils on low ridges on outwash plains and stream terraces. These soils formed in loess and in the underlying sandy eolian material. They are moderately permeable in the upper part and rapidly permeable in the lower part. Slope ranges from 0 to 5 percent.

Typical pedon of Tell silt loam, 2 to 5 percent slopes, 2,340 feet south and 774 feet west of the northeast corner of sec. 13, T. 18 N., R. 6 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; common fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt3—28 to 32 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

2BC—32 to 35 inches; yellowish brown (10YR 5/4) loamy sand; weak medium subangular blocky structure; very friable; common fine roots; common distinct dark yellowish brown (10YR 4/4) clay films bridging sand grains; medium acid; clear smooth boundary.

2C—35 to 60 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; thin discontinuous dark brown (7.5YR 4/4) loamy bands of sand; medium acid.

The thickness of the solum ranges from 25 to 40 inches. The Ap horizon has value of 3 or 4 and chroma of 2 to 4. Some pedons have an E horizon, which has value of 4 or 5 and chroma of 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loam. The 2C horizon is sand or loamy sand.

Thorp Series

The Thorp series consists of poorly drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy, stratified outwash. Permeability is slow in the upper part of the profile and moderately rapid in the lower part. Slope ranges from 0 to 2 percent.

Thorp soils are similar to Edgington soils. Edgington soils formed entirely in loess.

Typical pedon of Thorp silt loam, 515 feet east and 66 feet south of the northwest corner of sec. 10, T. 16 N., R. 6 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine granular structure; friable; many very fine roots; few fine bright accumulations of iron oxide; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium platy structure parting to moderate very fine subangular blocky; friable; common very fine roots; few faint very dark gray (10YR 3/1) organic coatings on faces of peds; few fine bright accumulations of iron oxide; neutral; clear smooth boundary.

Eg—12 to 21 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/1) dry; moderate coarse platy structure parting to moderate very fine subangular blocky; friable; common very fine roots; many faint light gray (10YR 7/1 dry) silt coatings and few faint brown (10YR 5/3) organic coatings on faces of peds; few fine bright accumulations of iron oxide; neutral; clear smooth boundary.

Btg1—21 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very fine roots; common faint grayish brown (2.5Y 5/2) clay films and many distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Btg2—34 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common distinct light gray (10YR 7/1 dry) silt coatings and few faint grayish brown (2.5Y 5/2) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Btg3—41 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few very fine roots; common distinct light gray (10YR 7/1 dry) silt coatings and common distinct brown (10YR 5/3) clay films on faces of peds; few fine dark accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2BCg—50 to 57 inches; light brownish gray (2.5Y 6/2) sandy clay loam that has thin strata of loamy sand; common medium prominent strong brown (7.5YR 5/8) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few distinct brown (10YR 5/3) clay films and common distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark accumulations of iron and manganese oxide; few pebbles; neutral; abrupt smooth boundary.

2Cg—57 to 60 inches; grayish brown (10YR 5/2) sandy loam; common fine distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; few fine dark accumulations of iron and manganese oxide; neutral.

The thickness of the solum ranges from 43 to 60 inches. The mollic epipedon ranges from 10 to 16 inches in thickness. The thickness of the loess ranges from 35 to 52 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Eg horizon has value of 5 or 6 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The 2Cg horizon is stratified in some pedons.

Udolpho Series

The Udolpho series consists of somewhat poorly drained soils on outwash plains. These soils formed in loess and in the underlying sandy outwash. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slope ranges from 0 to 2 percent.

The Udolpho soils in this county are taxadjuncts because they contain less sand in the upper part of the control section and are less gray than is definitive for the series. These differences, however, do not significantly affect the use or behavior of the soils.

Udolpho soils are similar to Kane and Orio soils. Kane soils have a mollic epipedon. The poorly drained Orio soils have less sand in the lower part than the Udolpho soils.

Typical pedon of Udolpho silt loam, 580 feet west and 660 feet south of the northeast corner of sec. 16, T. 18 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

E—9 to 16 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint yellowish brown (10YR 5/4) mottles; moderate thin platy structure; friable; few fine roots; common moderately thick very dark gray (10YR 3/1) organic coatings on faces of peds; medium acid; abrupt smooth boundary.

BE—16 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many faint dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt1—25 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and many fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—33 to 37 inches; grayish brown (10YR 5/2) sandy loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; few distinct dark grayish brown (10YR 4/2) clay films bridging sand grains; medium acid; clear smooth boundary.

2BC—37 to 52 inches; brown (10YR 5/3), stratified loamy sand and sand; many fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

2C—52 to 60 inches; stratified brown (10YR 5/3) sand and dark brown (10YR 4/3) loamy sand; common fine faint yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; single grain; loose; medium acid.

The thickness of the solum ranges from 32 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 10YR or 2.5Y and value of 4 to 6. It is silty clay loam or silt loam. The 2Bt and 2BC horizons have value of 5 or 6 and chroma of 2 or 3. The 2C horizon has value of 4 or 5 and chroma of 2 to 6. It is dominantly loamy sand or sand but in some pedons has thin strata of sandy loam.

Varna Series

The Varna series consists of moderately well drained soils on moraines. These soils formed in loess and in the underlying silty clay loam glacial till. Permeability is moderately slow. Slope ranges from 5 to 15 percent.

The Varna soils in this county are taxadjuncts because they have a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Typical pedon of Varna silt loam, 5 to 10 percent slopes, eroded, 1,200 feet east and 880 feet south of the northwest corner of sec. 12, T. 18 N., R. 11 E.

Ap—0 to 9 inches; mixed dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; few fine and common very fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to moderate fine subangular blocky; friable; common very fine roots; common distinct dark brown (10YR 3/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

2Bt2—15 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm;

common very fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; common fine soft accumulations of iron and manganese oxide; few small pebbles; slightly acid; clear smooth boundary.

2BC—20 to 32 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; very firm; common very fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine soft accumulations of iron and manganese oxide; few small pebbles; strong effervescence; mildly alkaline; gradual wavy boundary.

2C—32 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; massive; very firm; few fine soft accumulations of iron and manganese oxide; few small till pebbles; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 36 inches. The Ap horizon is silt loam or silty clay loam. The Bt and 2Bt horizons have hue 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. They are silty clay loam or silty clay.

Virgil Series

The Virgil series consists of somewhat poorly drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy outwash. Slope ranges from 0 to 2 percent.

Virgil soils are similar to Atterberry and Stronghurst soils. Atterberry and Stronghurst soils formed entirely in loess. Stronghurst soils have a surface layer that is lighter colored than that of the Virgil soils.

Typical pedon of Virgil silt loam, 1,993 feet west and 502 feet south of the northeast corner of sec. 2, T. 15 N., R. 8 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 13 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; moderate medium platy structure; friable; common fine roots; common fine soft accumulations of iron and manganese oxide; neutral; clear smooth boundary.

Bt1—13 to 18 inches; dark brown (10YR 4/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; common fine roots; many distinct dark grayish brown (10YR 4/2) clay films and few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—18 to 25 inches; brown (10YR 5/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common fine roots; many distinct dark grayish brown (10YR 4/2) clay films and few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine soft accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Btg1—25 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium distinct strong brown (7.5YR 5/6) and common medium faint light brownish gray (2.5Y 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct brown (10YR 4/2) clay films and few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine soft accumulations of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg2—33 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam; common coarse prominent strong brown (7.5YR 5/6) and common fine distinct brown (10YR 5/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; common fine soft accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

2BCg—45 to 60 inches; grayish brown (2.5Y 5/2) loam; common medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) and few fine distinct gray (N 6/0) mottles; weak medium prismatic structure; friable; few fine roots; few faint dark grayish brown (10YR 4/2) clay films on faces of peds; common fine soft accumulations of iron and manganese oxide; few small pebbles; slightly acid.

The thickness of the solum ranges from 42 to 65 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 and Btg horizons have hue of 10YR or

2.5Y, value of 4 to 6, and chroma of 2 to 4. The 2BCg horizon has strata of sandy loam, silt loam, or loamy sand in some pedons.

Wallkill Series

The Wallkill series consists of very poorly drained soils on outwash plains and in depressions on moraines. These soils formed in silty colluvial material over organic deposits. Permeability is moderate in the silty material and moderately rapid or rapid in the organic material. Slope ranges from 0 to 2 percent.

The Wallkill soils in this county are taxadjuncts because they have more clay and less sand in the upper part than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Wallkill soils are similar to Houghton and Lena soils. Houghton and Lena soils have a histic epipedon.

Typical pedon of Wallkill silty clay loam, 1,710 feet east and 470 feet north of the southwest corner of sec. 12, T. 17 N., R. 7 E.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Bw1—10 to 22 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bw2—22 to 36 inches; black (N 2/0) mucky silt loam; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

2Oa—36 to 60 inches; black (N 2/0) sapric material; about 10 percent fiber, 2 percent rubbed; massive; friable; few fine roots; neutral.

The thickness of the solum ranges from 30 to 45 inches. Depth to the organic material ranges from 16 to 40 inches. Free carbonates and limnic layers are in the organic material in some pedons.

The Ap or A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is silt loam, mucky silt loam, or silty clay loam. The Bw 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 3. It is silt loam, silty clay loam, or the mucky analogs of those textures. In some pedons snail shells are in the lower part of this horizon. The organic layers have hue of 10YR or are neutral in hue. They have chroma of 0 or 1. The material underlying the mineral soil is dominantly sapric or hemic, but some pedons have layers of coprogenous earth, marl, mineral soil, or woody or herbaceous plant material.

Warsaw Series

The Warsaw series consists of well drained soils on outwash plains, stream terraces, and moraines. These soils formed in loamy material and in the underlying calcareous sand and gravel. Permeability is moderate in the loamy material and very rapid in the underlying sand and gravel. Slope ranges from 0 to 10 percent.

Warsaw soils are similar to Waupecan soils. Waupecan soils have less sand in the upper part than the Warsaw soils.

Typical pedon of Warsaw loam, 2 to 5 percent slopes, 102 feet west and 1,260 feet north of the center of sec. 12, T. 18 N., R. 7 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, dark brown (10YR 4/3) dry; moderate fine granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—8 to 13 inches; very dark brown (10YR 2/2) loam, dark brown (10YR 4/3) dry; moderate fine granular structure; friable; few fine roots; many distinct very dark brown (10YR 2/2) organic coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—13 to 17 inches; dark yellowish brown (10YR 4/4) loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—17 to 22 inches; dark yellowish brown (10YR 4/4) loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; many distinct dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—22 to 27 inches; dark brown (7.5YR 4/4) loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark brown (10YR 3/3) clay films on faces of peds; few pebbles; slightly acid; clear smooth boundary.

2Bt4—27 to 31 inches; brown (7.5YR 5/4) gravelly sandy loam; weak medium subangular blocky structure parting to moderate fine granular; very friable; few fine roots; common distinct dark brown (7.5YR 4/4) clay bridges between sand grains; common pebbles; neutral; abrupt smooth boundary.

2C—31 to 60 inches; dark yellowish brown (10YR 4/4) very gravelly sand; single grain; loose; many pebbles; strong effervescence; moderately alkaline.

The thickness of the solum, the depth to free carbonates, and the depth to sandy material range from

26 to 36 inches. The dark surface layer ranges from 8 to 14 inches in thickness.

The Ap and A horizons have value of 2 to 4 and chroma of 1 to 3. They are loam or silt loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, clay loam, silt loam, or sandy loam. The 2Bt horizon is the gravelly analogs of the textures in the Bt horizon. The C horizon has value of 4 or 5.

Warsaw silt loam, 2 to 5 percent slopes, eroded, and Warsaw silt loam, 5 to 10 percent slopes, eroded, have a thinner dark surface layer than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Waukegan Series

The Waukegan series consists of well drained soils on outwash plains and moraines. These soils formed in loess and in the underlying sandy eolian material. They are moderately permeable in the upper part and rapidly permeable in the lower part. Slope ranges from 0 to 10 percent.

The Waukegan soils in this county are taxadjuncts because the increase in content of clay in the Bt horizon is slightly greater than is definitive for the series. Also, Waukegan silt loam, 2 to 5 percent slopes, eroded, and Waukegan silt loam, 5 to 10 percent slopes, eroded, have a thinner dark surface layer than is definitive for the series. These differences, however, do not significantly affect the use or behavior of the soils.

Waukegan soils are similar to Port Byron soils. Port Byron soils have a mantle of loess that is thicker than that of the Waukegan soils.

Typical pedon of Waukegan silt loam, 0 to 2 percent slopes, 450 feet east and 1,744 feet north of the southwest corner of sec. 31, T. 18 N., R. 7 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—9 to 17 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—17 to 22 inches; dark brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common fine roots; few distinct very dark brown (10YR 2/2) and many distinct dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 30 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; abrupt smooth boundary.

2Bt3—30 to 34 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; abrupt smooth boundary.

2C—34 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; strong brown (7.5YR 5/6) iron bands between depths of 45 and 47 inches; slightly acid.

The thickness of the solum ranges from 30 to 45 inches. The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The 2Bt horizon is sandy loam, loamy sand, or loam. The 2C horizon is sand or loamy sand.

Waupecan Series

The Waupecan series consists of well drained soils on outwash plains and stream terraces. These soils formed in loess and in the underlying glacial outwash. Permeability is moderate in the upper part of the profile and very rapid in the lower part. Slope ranges from 0 to 5 percent.

Waupecan soils are similar to Assumption, Catlin, Plano, Saybrook, and Tama soils. The similar soils have less sand in the lower part than the Waupecan soils.

Typical pedon of Waupecan silt loam, 0 to 2 percent slopes, 474 feet north and 400 feet west of the southeast corner of sec. 30, T. 17 N., R. 7 E.

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

A—8 to 11 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; few fine roots; common distinct very dark brown (10YR 2/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

BA—11 to 16 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—16 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—28 to 37 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—37 to 40 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt4—40 to 46 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; common faint brown (7.5YR 4/4) clay bridges between sand grains; neutral; clear smooth boundary.

2Bt5—46 to 51 inches; strong brown (7.5YR 5/6) loamy sand; very weak medium subangular blocky structure; very friable; common faint dark brown (7.5YR 4/4) clay bridges between sand grains; many pebbles; slightly acid; clear smooth boundary.

2C—51 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 55 inches. The thickness of the loess ranges from 40 to 50 inches.

The Ap and A horizons have value of 2 or 3. The 2Bt horizon has chroma of 4 to 6. It is sandy loam, loamy sand, or gravelly loamy sand. The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from very gravelly sandy loam to sand and gravel.

Waupecan silt loam, 2 to 5 percent slopes, eroded, is a taxadjunct because it has a thinner dark surface soil than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Formation of the Soils

Soil-forming processes act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the parent material, the plant and animal life on and in the soil, the climate, the relief, and the length of time that the forces of soil formation have acted on the soil material *(3)*.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks, slowly changing it into a natural body that has genetically related horizons. The material weathered from rocks may have been relocated by water, glaciers, or the wind. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the others.

Parent Material

Parent material is the unconsolidated geologic material in which a soil forms. It determines the chemical and mineralogical composition of the soil. Most of the parent material in Bureau County was deposited by wind, glaciers, or glacial meltwater. In some areas the material was reworked and redeposited by the subsequent actions of water and wind. Although all of the parent material in the county is of common glacial origin, its properties vary greatly, sometimes within small areas, depending on how the material was deposited. The soils in the county formed dominantly in loess, glacial till, outwash deposits, dune sand, alluvium, organic material, and bedrock residuum.

Loess is the major kind of parent material in the county. It ranges from about 8 to 20 feet in thickness on the nearly level uplands. The Mississippi River Valley was the main source of the loess, but the valley of the Rock River and the lowlands along the Green River also were important sources. Tama soils are an example of soils that formed entirely in loess.

Glacial till is material that was laid down directly by glaciers with a minimum of water action. It was deposited in Bureau County during the Illinoian and Wisconsinan glacial periods. The most recent glacier, of Wisconsinan age, receded from the survey area about 14,000 years ago. Wisconsinan glacial drift forms a series of morainic belts that occur as north-south trending ridges in the central and eastern parts of the county. The drift was deposited by glaciers from the north *(14)*. It was later mantled by loess throughout the county. It includes reddish brown, Tiskilwa drift, which is dominantly west of Bureau Creek and brown Malden drift, which is east of Bureau Creek. The well drained Parr and Saybrook soils are examples of soils that formed in loess and in the underlying Tiskilwa drift. The moderately well drained Catlin and Varna soils formed in loess and in the underlying loam and silty clay loam Malden drift.

Illinoian glacial drift is deposited on a till plain in the southwestern part of the county. In many places it has a paleosol, or relict buried soil. It includes dark greenish Radnor drift and brown Lee Center drift. The Lee Center drift was previously thought to be Wisconsinan but is now considered to be Illinoian because in some areas it has a paleosol. The moderately well drained Assumption soils are an example of soils that formed in loess and in the underlying loam Lee Center and Radnor drifts. Hickory soils formed in areas where the paleosol has been removed by erosion.

Outwash material was deposited by glacial meltwater carrying great loads of sediment. This material generally occurs as strata of differing particle sizes. The size of the particles in individual strata ranges from clay to gravel, depending on the velocity of the stream that carried the material. The coarse particles, such as gravel and sand, were deposited as the water slowed down. The finer particles, such as very fine sand, silt, and clay, were deposited in much more slowly moving or standing water. The well drained Plano and somewhat poorly drained Elburn soils are examples of soils that formed in outwash deposits.

Sand dunes formed when the wind sorted the finer particles from the coarser particles on outwash plains that dried up as the amount of glacial meltwater diminished. The dunes are most extensive in the northwestern part of the county. Some have migrated onto the morainal hills to the east and some onto terraces along the major streams. The excessively drained Sparta and well drained Oakville soils formed in areas of dune sand.

Alluvium is material that was recently deposited by floodwater along streams. It varies in texture, depending on the velocity of the floodwater. Examples of soils that formed in alluvial material are the moderately well drained Minneiska and poorly drained Moundprairie soils.

Organic deposits, such as muck and peat, are made up of plant remains that accumulated in wet depressions on outwash plains, flood plains, and till plains after glaciers withdrew from the survey area. In many areas these deposits have underlying layers of sedimentary peat and marl. In some areas they are interbeded. Marl is mostly mineral material that is low in content of organic matter and high in content of calcium carbonate. It formed during an open-water stage of bog development that preceded the period when decaying plant vegetation filled the bog. Houghton and Lena soils formed entirely in organic material. Aurelius soils formed in organic material over marl and sandy sediments. Edwards soils formed in organic deposits over interbeded layers of marl and sedimentary peat.

Some of the soils in Bureau County formed in material weathered from shale bedrock. The shale residuum is mantled by loess. Marseilles soils formed in loess and in the underlying material weathered from shale.

Plant and Animal Life

Plants have been the principal organisms influencing the formation of soils in Bureau County. Bacteria, actinomycetes, fungi, algae, protozoa, earthworms, insects, and human activities also have been important.

The chief contribution of plant and animal life to soil formation is the addition of organic material and nitrogen to the soil. 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 hardwoods. As the grasses died and decomposed, many fine, fibrous roots added large amounts of organic matter to the soils. The soils that formed under grasses have a thick, black or dark brown surface layer. Examples are Tama and Muscatine soils. In contrast, soils that formed under deciduous trees have a thinner, lighter colored surface layer because the source of their organic matter is mainly leaf litter on the surface. Fayette and Rozetta 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 sod aggregates, which are structural units made up of sand, silt, and clay, 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 soils and help to keep the soils open and porous. Human activities, such as clearing forests, cultivating, and applying fertilizer, also affect soil formation.

Climate

Climate is an important factor in the formation of soils. It influences the kind of plant and animal life on and in the soil. Precipitation affects the weathering of minerals and the transporting of soil material. Temperature determines the rate of chemical reaction that occurs in the soil. The general climate has had an important overall influence on the characteristics of the soils, but it does not cause major differences among soils in a relatively small area, such as a county.

Relief

Relief has markedly affected the soils in Bureau County through its influence on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes in the county range from 0 to 60 percent. Natural drainage ranges from excessively drained on sandy ridgetops to very poorly drained in depressions. Through its affect on aeration of the soil, drainage determines the color of the soil. 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 very poorly drained soils. In Fayette and other well drained, well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Sable and other poorly drained, poorly aerated soils are dull gray and mottled.

Relief greatly affects the rate of soil erosion. This rate increases as the length and gradient of slopes increase.

Time

Time, usually several thousand years, is necessary for the development of distinct horizons in the soil. Differences in length of time that the parent material has been in place are commonly reflected in the degree of profile development. In a given period of time, however, some soils form rapidly and others form slowly. The length of time necessary for a soil to form is influenced by the other factors of soil formation.

In general, soils form more rapidly in the more permeable material containing easily weatherable minerals with a low content of calcium carbonate than in slowly permeable material that has a high content of calcium carbonate. Soil formation is more rapid under forest vegetation than under prairie vegetation because the water entering the soils under forest vegetation is more acid and is more effective in leaching soluble bases. Soil formation is slower in strongly sloping areas because less water infiltrates the soil and the resulting runoff increases the extent of natural erosion of the surface layer. Soils that form in nearly level areas accumulate water from the adjacent slopes. The additional water results in more rapid leaching of soluable compounds and thus more rapid soil formation.

The soils in Bureau County range from young to mature in their degree of horizon development. Coarse textured soils, such as Oakville and Sparta soils, consist mostly of slowly weatherable quartz minerals. The degree of profile development is limited even though the soils are readily leached of calcium carbonates and tend to become acid. These soils remain young over time. Soils that form in recent alluvial sediments, such as Lawson and Otter soils, also remain young because they frequently receive deposits of alluvium.

Soils that are intermediate in maturity, such as Fayette and Tama soils, are on relatively stable landscapes where deposition is negligible. These soils formed over a relatively short period of time. Most of the soils in the county are of intermediate maturity.

Edgington soils are an example of mature soils that have distinct horizons. They have a leached subsurface layer and contain more clay in the subsoil than Tama soils even though they formed over the same period of time, in the same kind of parent material, and under the same kind of vegetation. Edgington soils formed in depressions that collect runoff from the surrounding slopes. The additional water accelerated the leaching of soluble minerals from the surface layer to the subsoil.

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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.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

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.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

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.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

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 constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

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.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

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.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of humans or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.
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 as much as 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, as much as 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 underlying material below the water table.
Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
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.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. 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 colored, 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.

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.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

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. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in 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 draw bar 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.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

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.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

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.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

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.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity. A "scald."

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.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

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.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediments of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 soil blowing 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 soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the 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.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

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.