United States Department of Agriculture

Soil Conservation Service

In cooperation with Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Soil and Water Conservation Committee

Soil Survey of Benton County, Indiana

How To Use This Soil Survey

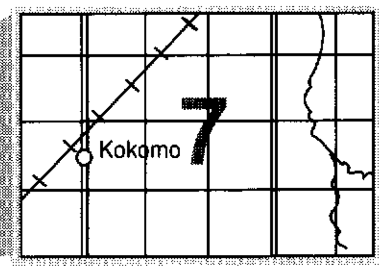
General Soil Map

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.

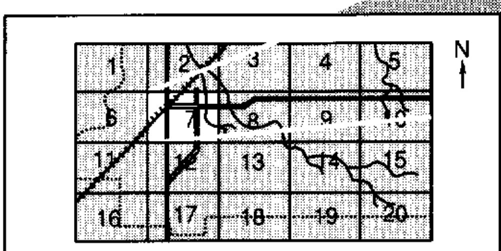
Detailed Soil Maps

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



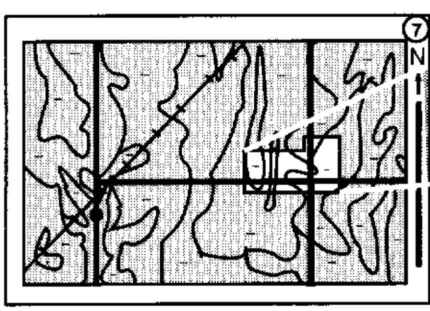
MAP SHEET

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.

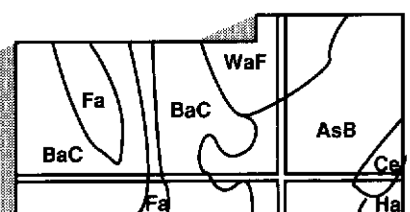


INDEX TO MAP SHEETS

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



MAP SHEET



AREA OF INTEREST

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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Benton County Soil and Water Conservation District. Financial assistance was made available by the Benton County Commissioners.

Cover: An area of Chalmers and Lisbon soils in the west-central part of Benton County. Chalmers soils are in the darker areas.

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Soil Series

Issued December 1989

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Benton 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 to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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

Robert L. Eddleman
State Conservationist
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Location of Benton County in Indiana.

Soil Survey of
Benton County, Indiana

By James R. Barnes, Soil Conservation Service

Fieldwork by James R. Barnes, Paul McCarter, Jr., George McElrath, Jr., and Byron G. Nagel, Soil Conservation Service, and Gregory L. Biberdorf, Jerry W. Heltsley, Lawrence E. McGhee, and Mark S. Plank, Indiana Department of Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service, in cooperation with
Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Soil and Water Conservation Committee

BENTON COUNTY is in the northwestern part of Indiana. It has an area of 260,237 acres, or about 407 square miles. Fowler is the county seat. It is in the central part of the county.

The survey area was inhabited by the Potawatomi and Kickapoo Indians before it was settled. The first known permanent settlers arrived in 1831. They settled in an area along Big Pine Creek. The county was established by an act of the Indiana State Legislature on February 18, 1840. It was named Benton County in honor of Thomas Hart Benton, a United States Senator from Missouri who championed the cause of westward expansion in the United States in the early 1800's. Initial settlement was confined mainly to the wooded areas near streams and creeks because the nearly level prairies were considered barren and desolate. The first county seat was established in Oak Grove Township in 1843. It was named Oxford. When the county courthouse and jail needed to be repaired in 1874, the site of the county seat was changed to Fowler.

Farming is the main enterprise in the county. About 95 percent of the acreage is cropland. Corn, soybeans, small grain, and hay are the principal crops. Some specialty crops are grown in the county. Examples are asparagus, kidney beans, and sweet corn. The raising of livestock is an important enterprise.

Urban development is limited to areas immediately surrounding the larger towns in the county. Most residents are employed in farming and agriculture-related businesses. Industrial activity within the county is limited, and many residents not engaged in agriculture are employed in adjacent counties.

This soil survey updates the survey of Benton County published in 1917 (*6*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

The paragraphs that follow describe the natural features in Benton County that affect soil use. These features are physiography, relief, and drainage; water supply; and climate. Transportation facilities and trends in population and land use also are described.

Physiography, Relief, and Drainage

Benton County is made up mainly of nearly level and gently sloping ground moraines. Scattered areas of more strongly sloping end moraines are throughout the county. These include the Nebo-Gilboa Ridge, which extends across the northern part of the county; the Chatsworth Moraine, which extends from the southwestern part to the central part; the Cropsey Moraine, in the southwestern part; and the Crawfordsville Moraine, in the south-central part (*3*). Some medium-sized outwash plains border Sugar and Big Pine Creeks. Flood plains, which are generally narrow, border Sugar, Big Pine, and Mud Pine Creeks. The county has a few areas of organic soils. These areas are generally small.

The highest elevation in the county is about 915 feet above sea level. It is about 3.5 miles north and 1.0 mile west of Boswell. The lowest elevation is about 670 feet above sea level. It is in an area where Big Pine Creek flows out of the county, about 2.5 miles south of Templeton.

The county is drained by five main streams. Big Pine Creek flows south through the east-central part of the county, into Warren County, and eventually into the Wabash River. Mud Pine Creek flows south through the central part of the county and into Warren County, where it joins Big Pine Creek. Sugar and Mud Creeks flow west through the northwestern part of the county and into Iroquois County, Illinois. They eventually flow into the Iroquois River. Carpenter Creek flows east through the northeastern part of the county and into Jasper County. It eventually flows into the Iroquois River. Numerous smaller natural drainageways are throughout the county.

Water Supply

The water supply in Benton County is mainly ground water. The supply is sufficient in most areas. The principal sources are deposits of sand and gravel near streams and layers of sand and gravel intermixed with glacial till. In most areas of the county, the glacial till overlies Lower Mississippian bedrock. Some aquifers in siltstone and shale are poor sources of ground water. Wells are 50 to 350 feet deep. In the northeast and southeast corners of the county and in some areas along the southern boundary, the underlying bedrock is Upper Devonian black shale. Aquifers in this formation are poor sources of ground water. The potential yield of ground water from all sources ranges from about 10 to 400 gallons per minute (*4*). The county has public water supply systems near Ambia, Boswell, Earl Park, Fowler, Otterbein, and Oxford.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Benton County is cold in winter. Summers are quite hot but are characterized by occasional cool spells. Precipitation frequently occurs as snowstorms during the winter. It occurs chiefly as showers during the warmer months, when warm, moist air moves in from the south. The showers commonly are heavy. The total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Fowler, Indiana, in the period 1951 to 1972. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Fowler on January 16, 1972, is -18 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 106 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 about 37 inches. Of this, about 23 inches, or more than 62 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 19 inches. The heaviest 1-day rainfall during the period of record was 4.51 inches at Fowler on July 23, 1957. Thunderstorms occur on about 40 days each year. Tornadoes and severe thunderstorms strike occasionally. These storms are local in extent and of short duration. They cause sparse damage in narrow belts. Hailstorms sometimes occur in scattered small areas during the warmer part of the year.

The average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 13 inches. On the average, 16 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

Transportation Facilities

The county has about 40 miles of federal highways, 71 miles of state highways, and 666 miles of county roads. About half of the county roads are paved. The rest are surfaced either with crushed gravel or with packed dirt.

Several small airstrips are throughout the county. Three railway lines run through the county. One line runs from east to west across the southern part of the county, one runs from north to south across the western part, and one runs from northwest to southeast through the entire county.

Trends in Population and Land Use

In 1980, Benton County had a population of 10,218 and a population density of about 25 people per square mile (*11*). In 1910, the population was 12,688 (*6*); in

1960, it was 11,912; and in 1970, it was 11,262 (*10*). The population of Fowler was 2,319 in 1980. The population of the other major towns in the county was as follows: Oxford, 1,327; the part of Otterbein in Benton County, 818; Boswell, 810; Earl Park, 269; and Ambia, 274 (*11*).

About 95 percent of the acreage in the county is cropland, including permanent pasture. This acreage has remained fairly constant in recent years. The remaining 5 percent is urban land or woodland. The extent of residential and business development is limited. In 1976, an estimated 6,260 acres was urban or built-up land (*5*). The developed areas are mainly around Oxford, Otterbein, Fowler, and Boswell.

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 biologic 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 considerable 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, acidity, 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 interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were 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 were 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 state with a fairly high degree of probability 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 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 names, descriptions, and delineations of the soils identified on the general soil map of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the associations.

Soil Descriptions

Areas Dominated by Nearly Level and Gently Sloping Soils That Are Somewhat Poorly Drained to Very Poorly Drained; on Uplands

The landscape in these areas is nearly level and undulating and is characterized by many swells, swales, and drainageways. The soils are used mainly for cultivated crops. Excess water, erosion, and runoff are the main management concerns.

1. Gilboa-Chalmers-Selma, Till Substratum, Association

Silty soils that are nearly level and gently sloping, are somewhat poorly drained and poorly drained, and formed in silty deposits, outwash, and glacial till; on end moraines and ground moraines

This association consists of soils on uplands. The landscape is nearly level and undulating and has many swales, swells, and drainageways.

This association makes up about 60 percent of the county. It is about 29 percent Gilboa and similar soils, 23 percent Chalmers and similar soils, 17 percent Selma soils, and 31 percent minor soils.

Gilboa soils are nearly level and gently sloping and are somewhat poorly drained. They are along and in drainageways, on low flats and rises, on long side slopes, and on knolls. Typically, the surface layer is very dark gray silt loam. The subsurface layer is very dark grayish brown silt loam. The subsoil is dark yellowish brown silty clay loam and yellowish brown and light olive brown loam.

Chalmers soils are nearly level and poorly drained. They are in broad low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray silty clay loam. The subsoil is gray and light brownish gray silty clay loam and gray loam.

The Selma soils in this association have a till substratum. They are nearly level and poorly drained. They are in broad low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface soil is black and very dark gray silty clay loam. The subsoil is gray silty clay loam and grayish brown clay loam and loam.

The minor soils in this association are the moderately well drained Barce, Corwin, Foresman, and Montmorenci soils. These soils are in the higher, more sloping areas.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Excess water, erosion, and runoff are the main management concerns.

This association is generally unsuitable as a site for buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and moderately slow permeability are the main limitations.

2. Bryce-Swygert Association

Clayey and silty soils that are nearly level and gently sloping, are poorly drained and somewhat poorly drained, and formed in water-sorted deposits and glacial till; on end moraines

This association consists of soils on uplands. The landscape is nearly level and undulating and has many swales, swells, and drainageways.

This association makes up about 1 percent of the county. It is about 48 percent Bryce soils, 48 percent Swygert soils, and 4 percent minor soils (fig. 1).

Bryce soils are nearly level and poorly drained. They are on low flats and in depressional areas, narrow drainageways, and swales. Typically, the surface layer is very dark gray silty clay. The subsoil is dark gray, olive gray, and light olive gray, mottled silty clay.

Swygert soils are nearly level and gently sloping and are somewhat poorly drained. They are on flats, along and in drainageways, and on low rises, knolls, long slopes, and ridgetops. Typically, the surface layer is very dark gray silty clay loam. The subsoil is brown, grayish brown, and gray silty clay.

The minor soils in this association are the poorly drained Selma soils in the lower depressions.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Excess water, erosion, and runoff are the main management concerns.

This association is generally unsuitable as a site for buildings, local roads and streets, and sanitary facilities. Ponding, wetness, slow or very slow permeability, and the shrink-swell potential are the main limitations.

3. Chalmers-Lisbon-Drummer Association

Silty soils that are nearly level, are poorly drained and somewhat poorly drained, and formed in silty deposits and in glacial till or outwash; on ground moraines

This association consists of soils on uplands. The landscape is nearly level and has some swells, swales, and drainageways.

This association makes up about 4 percent of the county. It is about 35 percent Chalmers and similar soils, 20 percent Lisbon and similar soils, 12 percent Drummer soils, and 33 percent minor soils (fig. 2).

Chalmers soils are poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer

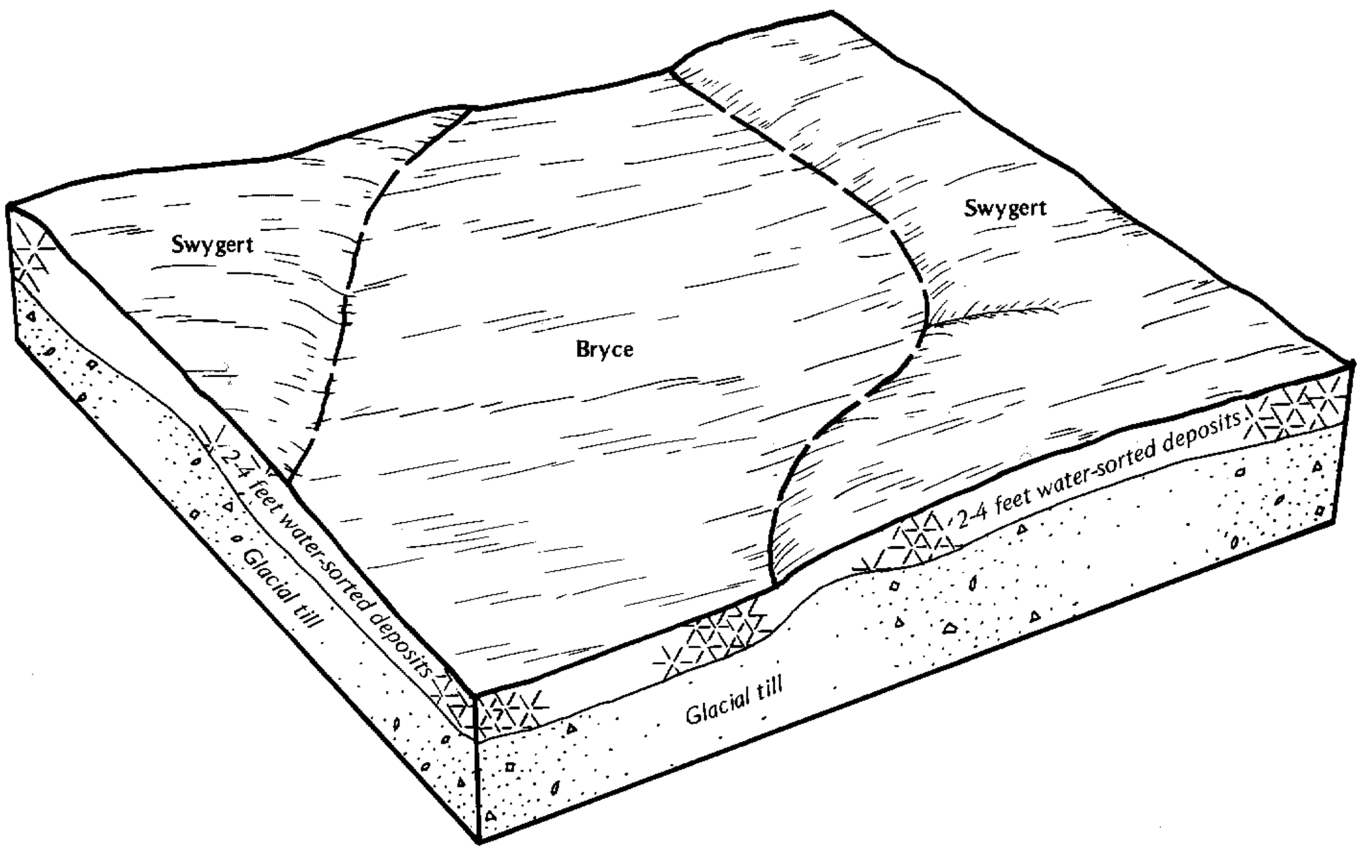

Figure 1.—Pattern of soils and parent material in the Bryce-Swygert association.

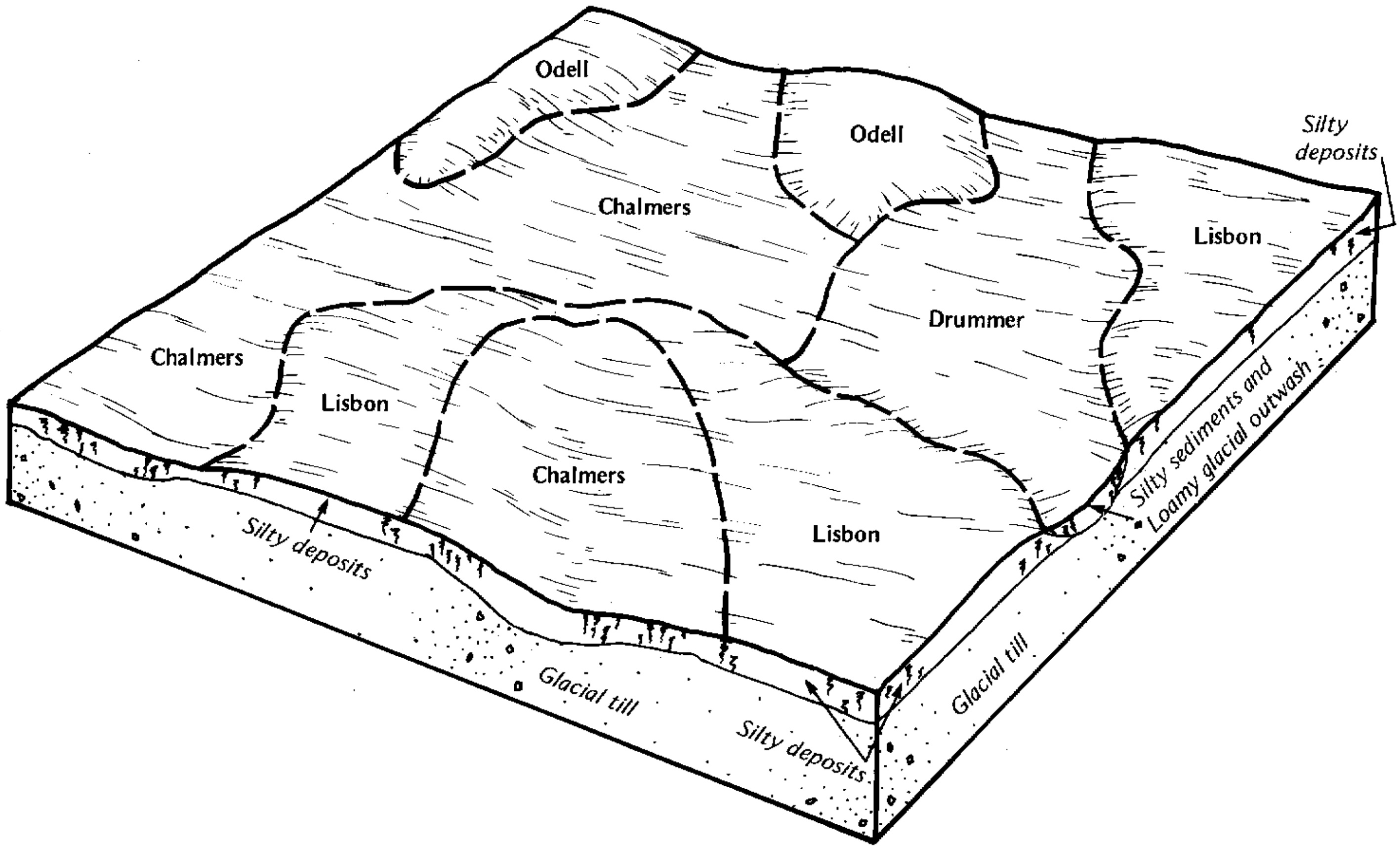

Figure 2.—Pattern of soils and parent material in the Chalmers-Lisbon-Drummer association.

is very dark gray silty clay loam. The subsoil is gray and light brownish gray silty clay loam and gray loam.

Lisbon soils are somewhat poorly drained. They are along and in drainageways, on broad low flats, and on low rises. Typically, the surface soil is very dark gray silt loam. The subsoil is dark grayish brown, brown, and light olive brown silty clay loam.

Drummer soils are poorly drained. They are in broad low areas, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray silty clay loam. The subsurface layer is black silty clay loam. The subsoil is gray silty clay loam and silt loam.

The minor soils in this association are the moderately well drained Barce, Corwin, and Montmorenci soils; the somewhat poorly drained Crane soils that have a till substratum; and the somewhat poorly drained Odell soils. Barce, Corwin, and Montmorenci soils are higher on the landscape than the Lisbon soils and are more sloping. Crane and Odell soils are slightly higher on the landscape than the Lisbon soils.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Ponding and wetness are the main management concerns.

This association is generally unsuitable as a site for buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and moderately slow permeability are the main limitations.

4. Wolcott-Odell-Selma, Till Substratum, Association

Loamy and silty soils that are nearly level, are very poorly drained to somewhat poorly drained, and formed in glacial till, silty deposits, and outwash; on ground moraines

This association consists of soils on uplands. The landscape is nearly level and has some swales, swells, and drainageways.

This association makes up about 2 percent of the county. It is about 35 percent Wolcott soils, 30 percent Odell soils, 16 percent Selma soils, and 19 percent minor soils.

Wolcott soils are very poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray loam. The subsurface layer is very dark grayish brown clay loam. The subsoil is dark gray, dark grayish brown, grayish brown, and light gray loam.

Odell soils are somewhat poorly drained. They are along and in drainageways and on low flats and rises. Typically, the surface layer is very dark gray silt loam. The subsoil is brown silt loam and dark brown clay loam.

The Selma soils in this association have a till substratum. They are poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface soil is black and very dark gray silty clay loam. The subsoil is gray silty clay loam and grayish brown clay loam and loam.

The minor soils in this association are the moderately well drained Barce and Corwin soils. These soils are on the slightly higher parts of the landscape.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Ponding and wetness are the main management concerns.

This association is generally unsuitable as a site for buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and moderately slow permeability are the main limitations.

5. Elliott-Ashkum-Selma, Moderately Fine Substratum, Association

Silty soils that are nearly level and gently sloping, are somewhat poorly and poorly drained, and formed in glacial till, in water-sorted deposits and glacial till, and in silty deposits and outwash; on end moraines and ground moraines

This association consists of soils on uplands. The landscape is nearly level and undulating and has many swells, swales, and drainageways.

This association makes up about 6 percent of the county. It is about 35 percent Elliott and similar soils, 22 percent Ashkum soils, 15 percent Selma soils, and 28 percent minor soils (fig. 3).

Elliott soils are nearly level and gently sloping and are somewhat poorly drained. They are along and in drainageways and on broad flats, rises, knolls, long side slopes, and ridgetops. Typically, the surface layer is very

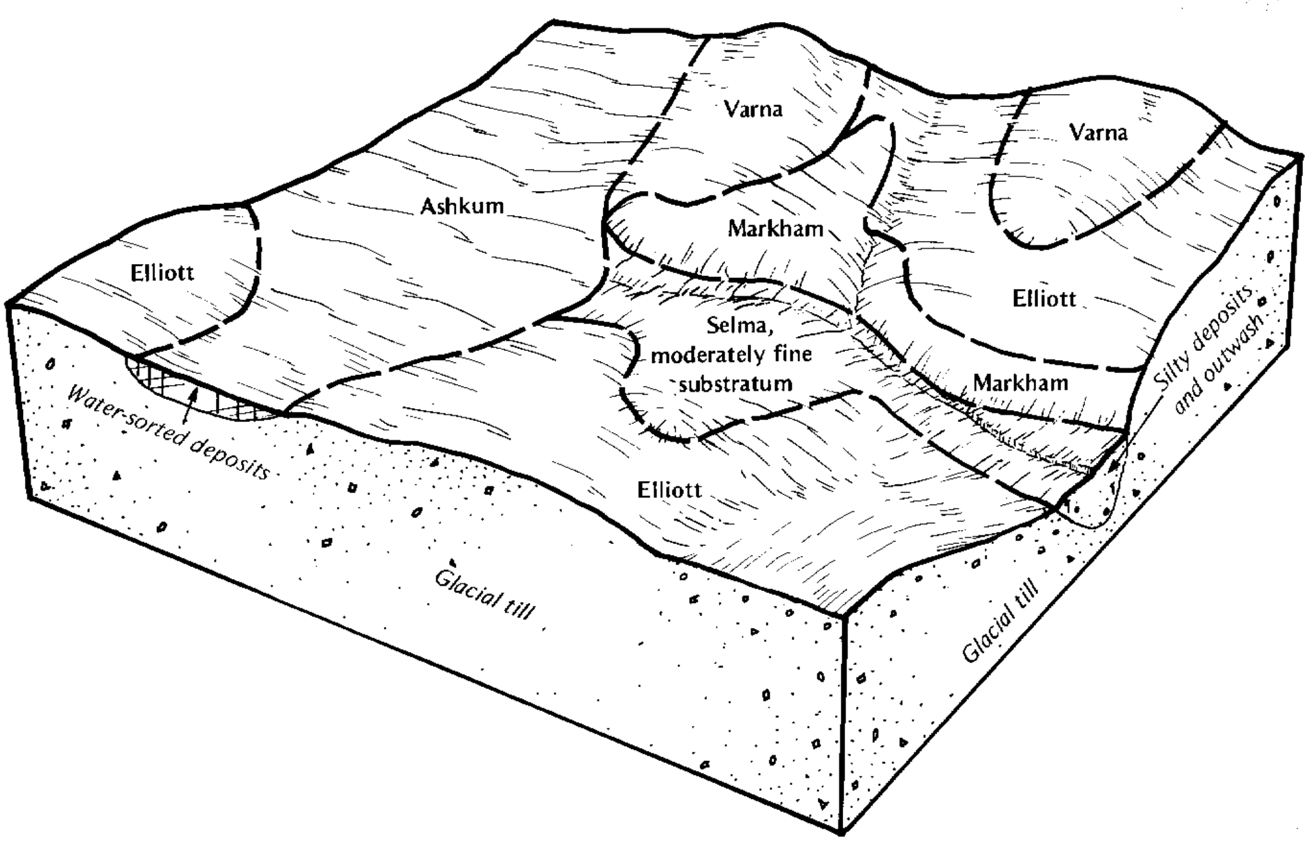

Figure 3.—Pattern of soils and parent material in the Elliott-Ashkum-Selma, moderately fine substratum, association.

dark grayish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. The subsoil is dark yellowish brown silty clay loam and yellowish brown silty clay and silty clay loam.

Ashkum soils are nearly level and poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is black silty clay loam. The subsurface layer is very dark gray silty clay loam. The subsoil is very dark gray silty clay loam, dark gray and gray silty clay and silty clay loam, and grayish brown silty clay loam.

The Selma soils in this association have a moderately fine textured substratum. They are nearly level and poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface soil is very dark gray silty clay loam. The subsoil is grayish brown silty clay loam and clay loam and grayish brown sandy clay loam.

The minor soils in this association are the moderately well drained Foresman soils that have a moderately fine textured substratum and the moderately well drained Markham and Varna soils. All of the minor soils are in the slightly higher, more sloping areas.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Excess water, erosion, and runoff are the main management concerns.

This association is generally unsuitable as a site for buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and slow or moderately slow permeability are the main limitations.

Areas Dominated by Nearly Level and Gently Sloping Soils That Are Poorly Drained, Very Poorly Drained, and Moderately Well Drained; on Bottom Land and Uplands

The uplands in these areas are nearly level and gently sloping and are characterized by a swale and swell topography. Steep slopes separate the uplands from the nearly level bottom land. The soils are used mainly for cultivated crops. Some undrained areas, which are unsuitable for cultivated crops, are used as pasture or woodland. Flooding, ponding, wetness, erosion, and runoff are the main management concerns. Also, droughtiness is a concern on the higher parts of the landscape.

6. Drummer-Comfrey-Tippecanoe Association

Silty soils that are nearly level and gently sloping, are poorly drained, very poorly drained, and moderately well drained, and formed in silty deposits and outwash and in alluvium and outwash; on flood plains, outwash terraces, and outwash plains

This association consists of soils on uplands and on the bottom land along the major streams. It is characterized by low relief on the bottom land, steep slopes between the areas of bottom land and the upland areas, and nearly level and gently sloping uplands that have a swale and swell topography.

This association makes up about 8 percent of the county. It is about 35 percent Drummer and similar soils, 25 percent Comfrey soils, 15 percent Tippecanoe soils, and 25 percent minor soils.

Drummer soils are nearly level and poorly drained. They are along and in narrow drainageways, on broad low flats, in depressional areas, and in swales on uplands. Typically, the surface layer is black silty clay loam. The subsurface layer is very dark gray silty clay loam. The subsoil is very dark gray, gray, grayish brown, and light brownish gray silty clay loam and gray silt loam.

Comfrey soils are nearly level and very poorly drained. They are on low bottom land, along streams and creeks, and in old stream channels. Typically, the surface layer is very dark gray silty clay loam. The subsurface layer is very dark gray silty clay loam and clay loam. The subsoil is dark gray loam.

Tippecanoe soils are nearly level and gently sloping and are moderately well drained. They are on broad flats, along drainageways, and on rises, long side slopes, ridgetops, and knolls in the uplands. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is very dark gray silt loam. The subsoil is brown silt loam, yellowish brown clay loam and gravelly sandy clay loam, and dark yellowish brown gravelly sandy loam and gravelly coarse loamy sand.

The minor soils in this association are the well drained Rush and Wea soils and the somewhat poorly drained Crane soils. Rush and Wea soils are higher on the landscape than the Tippecanoe soils, and Crane soils are slightly lower.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Some areas of the very poorly drained soils have not been drained and are used as pasture or woodland. These areas are generally unsuited to cultivated crops and are poorly suited to pasture. The other areas in the association are well suited to cultivated crops and pasture. Flooding, ponding, wetness, erosion, and runoff are the main management concerns. Also, droughtiness is a concern in areas of the Tippecanoe soils.

Because of flooding, ponding, and wetness, this association is poorly suited to woodland. Because of the flooding and ponding, the Drummer and Comfrey soils are generally unsuitable as sites for buildings, local roads and streets, and sanitary facilities. The Tippecanoe soils are fairly well suited to these uses. The wetness of these soils is a limitation.

Areas Dominated by Nearly Level to Moderately Steep Soils That Are Well Drained to Poorly Drained; on Uplands

The landscape in these areas is characterized by many swales, swells, and drainageways. The soils are used mainly for cultivated crops, hay, or pasture. Excess water, erosion, runoff, and the slope are the main management concerns.

7. Corwin-Odell-Chalmers Association

Silty soils that are nearly level to moderately sloping, are moderately well drained to poorly drained, and formed in glacial till and in silty deposits and glacial till; on end moraines

This association consists of soils on uplands. The landscape is characterized by many swales, swells, and drainageways.

This association makes up about 11 percent of the county. It is about 37 percent Corwin soils, 19 percent Odell soils, 16 percent Chalmers soils, and 28 percent minor soils (fig. 4).

Corwin soils are nearly level to moderately sloping and are moderately well drained. They are in broad areas, along drainageways, and on rises, long side slopes, knolls, and ridgetops. Typically, the surface layer is very dark grayish brown silt loam mixed with yellowish brown clay loam from the subsoil. The subsoil is yellowish brown, dark yellowish brown, and brown clay loam.

Odell soils are nearly level and gently sloping and are somewhat poorly drained. They are along and in drainageways and on low flats, rises, knolls, long side slopes, and ridgetops. Typically, the surface layer is very dark gray silt loam. The subsoil is brown silt loam and dark brown clay loam.

Chalmers soils are nearly level and poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray silty clay loam. The subsoil is gray and light brownish gray silty clay loam and gray loam.

The minor soils in this association are the well drained Miami soils, the moderately well drained Barce and Montmorenci soils, and the somewhat poorly drained

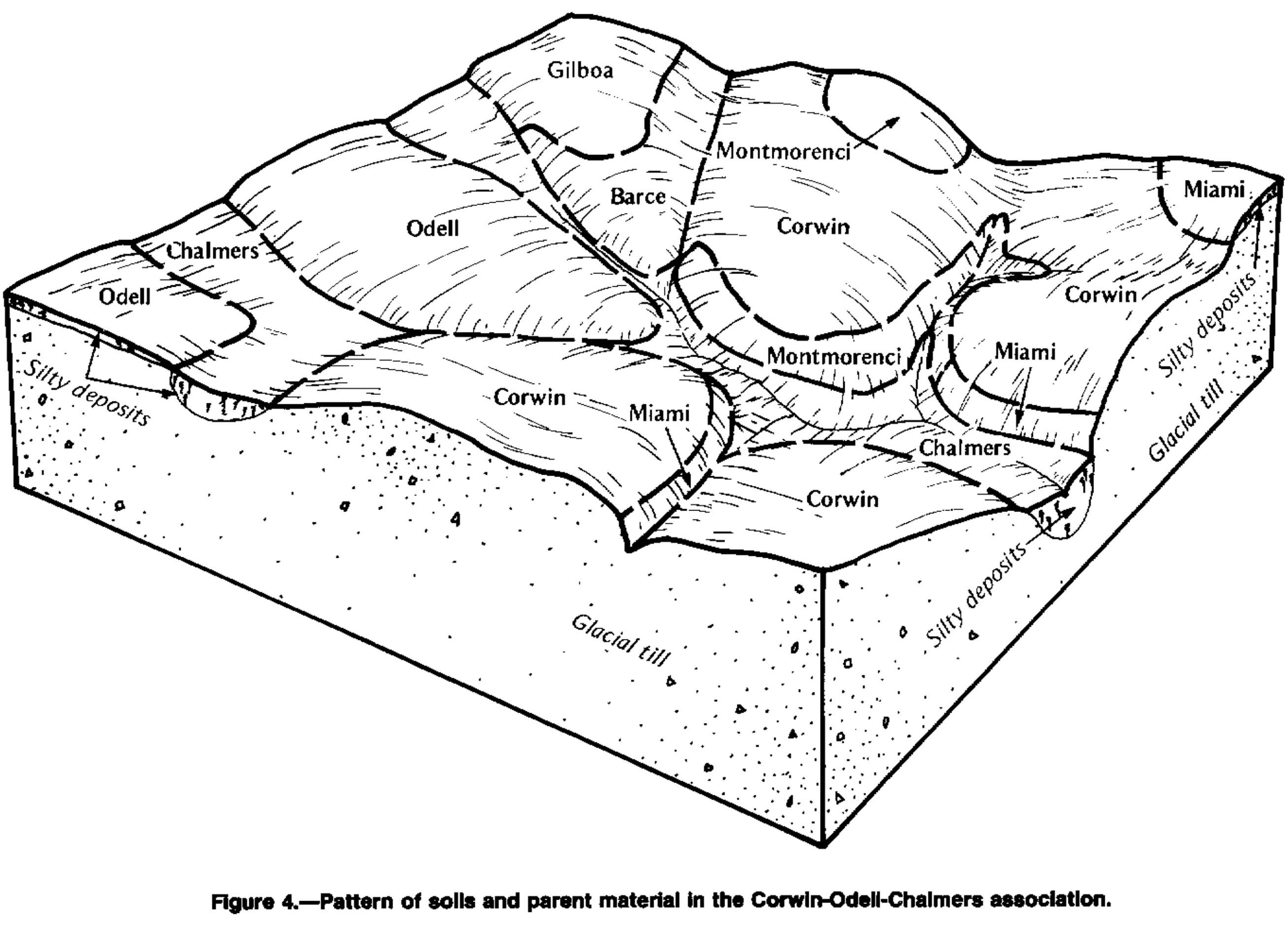

Figure 4.—Pattern of soils and parent material in the Corwin-Odell-Chalmers association.

Gilboa soils. Miami soils are slightly higher on the landscape than the Corwin soils and are more sloping. Barce and Montmorenci soils are in the same positions on the landscape as the Corwin soils. Barce soils have more sand in the upper part of the subsoil than the Corwin soils, and Montmorenci soils have a thinner surface layer. The somewhat poorly drained Gilboa soils are in the same positions on the landscape as the Odell soils. They have more sand in the upper part of the subsoil than the Odell soils.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association is well suited to cultivated crops. Excess water, erosion, and runoff are the main management concerns.

This association is poorly suited to buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and moderately slow permeability are the main limitations.

8. Montmorenci-Miami-Chalmers Association

Silty soils that are nearly level to moderately steep, are moderately well drained, well drained, and poorly drained, and formed in glacial till and in silty deposits and glacial till; on end moraines and ground moraines

This association consists of soils on uplands. The landscape is characterized by many swales, swells, and drainageways.

This association makes up about 3 percent of the county. It is about 31 percent Montmorenci and similar soils, 18 percent Miami soils, 16 percent Chalmers soils, and 35 percent minor soils.

Montmorenci soils are gently sloping and moderately well drained. They are along drainageways, in broad areas, and on high rises, ridgetops, long side slopes, and knolls. Typically, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is dark yellowish brown and yellowish brown clay loam and brown loam.

Miami soils are gently sloping to moderately steep and are well drained. They are along narrow drainageways and on rises, long side slopes, ridgetops, and knolls. Typically, the surface layer is brown silt loam mixed with yellowish brown subsoil material. The subsoil is yellowish brown silt loam, clay loam, and loam.

Chalmers soils are nearly level and poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray silty clay loam. The subsoil is gray and light brownish gray silty clay loam and gray loam.

The minor soils in this association are the somewhat poorly drained Conover, Gilboa, and Odell soils. These soils are typically in the lower areas.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. Some areas of the more sloping soils are used for hay or pasture. The association is fairly well suited to cultivated crops and is well suited to hay and pasture. Excess water, erosion, runoff, and the slope are the main management concerns.

This association is poorly suited to buildings, local roads and streets, and sanitary facilities. Ponding, wetness, the shrink-swell potential, the slope, and moderately slow permeability are the main limitations.

9. Odell-Montmorenci-Chalmers Association

Silty soils that are nearly level and gently sloping, are moderately well drained to poorly drained, and formed in silty deposits and glacial till and in glacial till; on end moraines and ground moraines

This association consists of soils on uplands. The landscape is nearly level and undulating and has many swales, swells, and drainageways.

This association makes up about 5 percent of the county. It is about 31 percent Odell soils, 24 percent Montmorenci soils, 17 percent Chalmers soils, and 28 percent minor soils (fig. 5).

Odell soils are nearly level and gently sloping and are somewhat poorly drained. They are along and in drainageways and on low flats, rises, knolls, long side slopes, and ridgetops. Typically, the surface layer is very dark gray silt loam. The subsoil is brown silt loam and dark brown clay loam.

Montmorenci soils are gently sloping and moderately well drained. They are along drainageways, in broad areas, and on high rises, ridgetops, long side slopes, and knolls. Typically, the surface layer is very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is dark yellowish brown and yellowish brown clay loam and brown loam.

Chalmers soils are nearly level and poorly drained. They are on broad low flats, in depressional areas, along and in narrow drainageways, and in swales. Typically, the surface layer is very dark gray silty clay loam. The subsoil is gray and light brownish gray silty clay loam and gray loam.

The minor soils in this association are the well drained Miami soils, the moderately well drained Corwin soils, the poorly drained Drummer soils, and the poorly drained Selma soils that have a till substratum. Miami soils are on the steeper slopes and in areas adjacent to bottom land. Corwin soils have a surface layer that is thicker than that of the Montmorenci soils. They are in the same positions on the landscape as the Montmorenci soils. Drummer and Selma soils have more sand in the lower part of the subsoil than the Chalmers soils. They are in the same positions on the landscape as the Chalmers soils.

This association is used mainly for cultivated crops. Corn, soybeans, and small grain are the major crops. Most of the acreage has been drained. The association

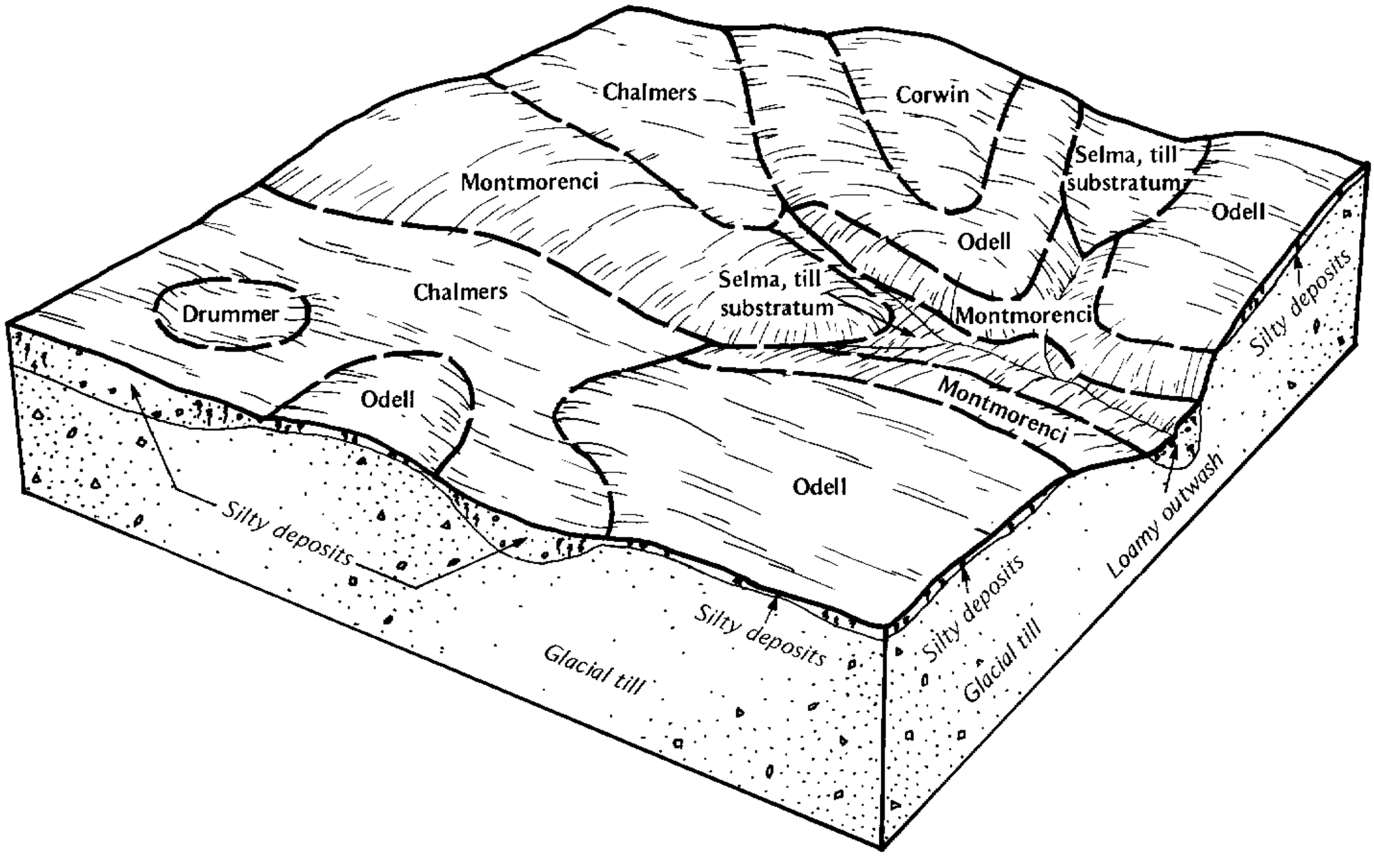

Figure 5.—Pattern of soils and parent material in the Odell-Montmorenci-Chalmers association.

is well suited to cultivated crops. Excess water, erosion, and runoff are the main management concerns.

This association is poorly suited to buildings, local roads and streets, and sanitary facilities. Ponding, wetness, and moderately slow permeability are the main limitations.

Broad Land Use Considerations

The rate of urban development in Benton county is fairly low. Only 6,260 acres, or about 2.4 percent of the total acreage, is urban or built-up land (*5*). Each year, however, small areas are developed for nonagricultural uses. As long as there is a demand for these uses, planning for orderly growth is important.

The general soil map is useful in planning future changes in land use, but it should not be used to select sites for specific structures. The soils that are well suited to cultivated crops may not be well suited to urban development.

Areas where the soils are so unfavorable that urban development is not desirable or is nearly prohibited are very extensive in Benton County. In the Gilboa-Chalmers-Selma, till substratum, Drummer-Comfrey-Tippecanoe, Bryce-Swygert, Chalmers-Lisbon-Drummer, Wolcott-Odell-Selma, till substratum, Elliott-Ashkum-Selma, moderately fine substratum, and Odell-Montmorenci-Chalmers associations and in many areas of the Corwin-Odell-Chalmers and Montmorenci-Miami-Chalmers associations, a high water table is above or near the surface part of the year. Providing drains and outlets that lower the water table enough to permit urban development is costly. Most of the soils are severely limited as sites for septic tank absorption fields because of moderately slow to very slow permeability. Onsite evaluation, extensive drainage systems, properly designed sanitary facilities, and careful selection of building sites are needed.

Urban development is affected by some limitations in areas of the Corwin soils in the Corwin-Odell-Chalmers association, the Tippecanoe soils in the Drummer-Comfrey-Tippecanoe association, and the Montmorenci and Miami soils in the Montmorenci-Miami-Chalmers and Odell-Montmorenci-Chalmers associations. If measures that overcome these limitations are applied, however, these soils are fairly well suited to urban uses. Comfrey soils should not be developed for urban uses because they are subject to flooding and ponding.

All of the associations in the county are well suited or fairly well suited to cultivated crops, pasture, and hay. Wetness is the main limitation. It can be overcome by a drainage system. Measures that control erosion and runoff are needed in the more sloping areas of all the associations.

Only a few areas in Benton County are wooded. Most of the trees in the county are planted as windbreaks or field boundaries. The trees planted as windbreaks generally grow best on the better drained soils in the Corwin-Odell-Chalmers, Drummer-Comfrey-Tippecanoe, Montmorenci-Miami-Chalmers, and Odell-Montmorenci-Chalmers associations. Proper management practices and selection of suitable species can result in optimum growth rates.

Most of the associations are poorly suited to parks and other intensive recreational uses. Wetness, ponding, moderately slow to very slow permeability, and a high content of clay are the major management concerns. A drainage system is beneficial. The Corwin-Odell-Chalmers, Drummer-Comfrey-Tippecanoe, Montmorenci-Miami-Chalmers, and Odell-Montmorenci-Chalmers associations are fairly well suited to intensive recreational uses. The main management concerns are wetness, ponding, flooding, restricted permeability, erosion, and slope. Excellent nature study areas are available in these associations.

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 underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Corwin silt loam, 2 to 6 percent slopes, eroded, is a phase of the Corwin series.

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.

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

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

AnA—Andres silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is in low areas, along and in drainageways, and on low rises in the uplands. Areas are irregular in shape and are 3 to 200 acres in size. The dominant size is about 20 acres.

Typically, the surface soil is very dark brown silt loam about 12 inches thick. The subsoil is about 28 inches thick. It is mottled. The upper part is brown, friable clay loam, and the lower part is light olive brown, firm silty clay loam. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In some places the solum has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In many areas the solum has more clay. In places the lower part of the solum and the underlying material have less clay. In some small areas the depth to the underlying material is less than 36 or more than 60 inches. In a few areas the upper part of the underlying material has stratified sandy and loamy material. In a few places the lower part of the subsoil has more gravel.

Included with this soil in mapping are a few small areas of the poorly drained Ashkum soils in depressions. These soils make up about 10 to 13 percent of the unit.

The available water capacity in the Andres soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet from late winter to late spring. The organic matter content is high in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are problems. The root zone is shallow because excess water hinders root growth. Excess water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a ridge-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, the buildings can be constructed on raised, well compacted fill material.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts help to overcome these limitations.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

AnB—Andres silt loam, 2 to 4 percent slopes. This gently sloping, somewhat poorly drained soil is along and in narrow drainageways and on low rises, long side slopes, and knolls in the uplands. Areas are generally irregular in shape and are 3 to 40 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is brown, dark yellowish brown, and yellowish brown, friable clay loam. The lower part is brown and grayish brown, firm silty clay loam. The underlying material to a depth of about 60 inches is brown, mottled silty clay loam. In a few places the solum has less sand and more silt. In some areas the slope is less than 2 or more than 4 percent. In some small areas the soil is moderately eroded. In places the lower part of the solum and the underlying material have less clay. In some small areas the depth to the underlying material is less than 36 or more than 60 inches. In many areas the solum has more clay. In a few areas the upper part of the underlying material has stratified sandy and loamy material. In a few places the lower part of the subsoil has more gravel.

Included with this soil in mapping are a few small areas of the poorly drained Ashkum soils in depressions. These soils make up about 9 to 13 percent of the unit.

The available water capacity in the Andres soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 1 to 3 feet from late winter to late spring. The organic matter content is high in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards, and excess water is a limitation. Crusting is a problem. The root zone is shallow because the excess water hinders root growth. Erosion can be controlled by water- and sediment-control basins, terraces, diversions, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a till-plant cropping system. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Excess water can be removed by surface drains, subsurface drains, or a combination of these.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Erosion and runoff are hazards, and excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduced plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, the buildings can be constructed on raised, well compacted fill material.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets help to overcome these limitations.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

As—Ashkum silty clay loam. This nearly level, poorly drained soil is in broad low areas, in depressional areas, along and in narrow drainageways, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or long and narrow and are 3 to 400 acres in size. The dominant size is about 100 acres.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 6 inches thick. The subsoil is about 28 inches thick. It is mottled. The upper part is very dark gray, friable silty clay loam. The next part is dark gray and gray, friable silty clay and silty clay loam. The lower part is grayish brown, firm silty clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silty clay loam. In places the slope is more than 2 percent. In a few areas the lower part of the solum and the underlying material have more clay. In some small areas the depth to the underlying material is more than 60 inches. In many areas the solum has less clay or less sand, or both. In some places the underlying material is silt loam. In other places the dark surface soil is more than 24 inches thick. In some areas the upper part of the underlying material has stratified sandy and loamy material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Andres and Elliott soils on low knolls and rises. Also included are small areas of the moderately well drained Markham soils on the higher parts of the landscape. Included soils make up about 4 to 10 percent of the unit.

The available water capacity in the Ashkum soil is high. Permeability is moderately slow. Runoff is very slow or ponded. The water table is near or above the surface during the spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry and hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. Ponding hinders the use of farm equipment. Excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Ponding is a hazard, and frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in reduced plant density and hardiness. Grazing during wet periods causes compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to prevent surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and by frost action and improve the ability of the roads to support vehicular traffic.

The land capability classification is IIw. No woodland ordination symbol is assigned.

AyB2—Ayr Variant fine sandy loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is on slight rises, ridgetops, and knolls in the uplands. Areas are oval, elongated, or irregularly shaped. They are 3 to 45 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is about 10 inches of dark brown fine sandy loam mixed with yellowish brown loamy sand from the subsoil. The subsoil is about 45 inches thick. The upper part is yellowish brown, very friable loamy sand. The next part is dark brown, mottled, friable fine sandy loam. The lower part is yellowish brown, mottled, friable loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some places the outwash deposits are less than 20 or more than 50 inches thick. In other places the slope is less than 2 or more than 6 percent. In some small areas the underlying material is less than 40 or more than 60 inches thick. In a few places the surface layer is lighter colored.

Included with this soil in mapping are a few areas of the moderately well drained Brems Variant and moderately well drained and well drained Billet soils. These soils are in positions on the landscape similar to those of the Ayr Variant soil. Brems Variant soils have more sand than the Ayr Variant soil. Also included are the somewhat poorly drained Seafield soils on the lower parts of the landscape. Included soils make up about 7 to 15 percent of the unit.

The available water capacity in the Ayr Variant soil is moderate. Permeability is rapid in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 3 to 6 feet from winter to spring. The organic matter content is low in the surface layer. This layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion, runoff, and soil blowing are hazards. Also, the soil becomes droughty during the summer. Erosion can be controlled by water- and sediment-control basins, diversion terraces, a conservation tillage system that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a no-till cropping system. Grassed waterways help to control erosion in the drainageways. A permanent cover of vegetation or a cropping system that includes close-growing crops also helps to control erosion. Soil blowing can be controlled by establishing windbreaks, buffer strips, or vegetative barriers; applying a system of conservation tillage; planting cover crops or green manure crops; and ridging at an angle to the prevailing wind. A permanent cover of vegetation also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water in this soil.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Erosion, runoff, and soil blowing are hazards. Droughtiness is a problem in the summer. Deep-rooted legumes grow well. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and rotation grazing during the summer help to control erosion and soil blowing, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suitable as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Installing foundation drains helps to lower the water table.

Because of frost action, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets help to prevent the damage caused by frost action.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

BaB2—Barce loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is on broad flats, along drainageways, and on rises, long side slopes, knolls, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 400 acres in size. The dominant size is about 40 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown loam mixed with dark yellowish brown loam from the subsoil. The subsoil is about 33 inches thick. The upper part is dark yellowish brown, friable loam. The next part is yellowish brown, friable clay loam and mottled clay loam. The lower part is light olive brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In a few places the subsoil has less sand and more silt. In some areas the slope is less than 2 or more than 6 percent. In a few areas the upper part of the subsoil has less clay and more sand. In many small areas the depth to the underlying material is less than 40 or more than 60 inches. In many places the surface layer is lighter colored or thinner. In a few places the upper part of the underlying material has stratified sandy and loamy material. In a few areas the lower part of the solum and the underlying material have more sand and gravel. In a few areas the underlying material is silt loam glacial till.

Included with this soil in mapping are many small areas of the somewhat poorly drained Gilboa soils and other somewhat poorly drained soils on the lower parts of the landscape. The latter soils have a surface layer that is lighter colored or thinner than that of the Barce soil. Also included are a few areas of a moderately well drained, severely eroded soil on the steeper slopes. Included soils make up about 5 to 13 percent of the unit.

The available water capacity in the Barce soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 3 to 4 feet from winter to spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces (fig. 6), a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a no-till cropping system. Grassed waterways help to control erosion in the drainageways. A permanent plant cover or a cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Also, the wetness is a moderate limitation on sites for dwellings with basements. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to lower the water table.

Because of frost action and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. Crowning the roads improves drainage and thus minimizes the damage caused by shrinking and swelling.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank help to compensate for the restricted permeability. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

BaC2—Barce loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately well drained soil is along drainageways and on side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown loam mixed with dark yellowish brown sandy clay loam from the subsoil. The subsoil is about 30 inches thick. In sequence downward, it is dark yellowish brown and brown, friable sandy clay loam; brown, mottled, friable sandy clay loam; and light olive brown, mottled, firm loam. In places the slope is less than 6 or more than 12 percent. In a few areas the upper part of the subsoil has less clay and more sand. In many small areas the underlying material is at a depth of less than 40 or more than 60 inches. In many places the surface layer is lighter colored or thinner. In a few places the upper part of the underlying material has stratified sandy and loamy material. In a few areas the lower part of the solum and the underlying material have more sand and gravel. In a few areas the underlying material has silt loam glacial till.

Included with this soil in mapping are some small areas of the somewhat poorly drained Gilboa soils and other somewhat poorly drained soils on the lower parts of the landscape. The latter soils have a surface layer

Figure 6.—Parallel tile-outlet terraces in an area of Barce loam, 2 to 6 percent slopes, eroded.

that is lighter colored or thinner than that of the Barce soil. Also included are a few areas of a moderately well drained, severely eroded soil on the steeper slopes. Included soils make up about 7 to 14 percent of the unit.

The available water capacity in the Barce soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 3 to 4 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a no-till cropping system. Grassed waterways help to control erosion in the drainageways. A permanent plant cover or a cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Also, the wetness is a moderate limitation on sites for dwellings with basements. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to lower the water table. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Diversions between lots and retaining walls help to overcome the shrink-swell potential and the slope.

Because of frost action, the shrink-swell potential, and the slope, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action. Crowning the roads improves drainage and thus minimizes the damage caused by shrinking and swelling. Land shaping and constructing the roads on the contour help to overcome the slope.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank help to compensate for the restricted permeability. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

BbA—Barce silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on low rises and broad ridgetops in the uplands. Areas are generally irregular in shape and are 3 to 200 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark gray silt loam about 6 inches thick. The subsurface layer is very dark grayish brown silt loam about 6 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, friable loam. The next part is dark brown, friable gravelly sandy clay loam and dark brown, mottled, friable gravelly sandy clay loam. The lower part is yellowish brown, mottled, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In a few areas the upper part of the subsoil has less clay and more sand. In some small areas the underlying material is at a depth of less than 40 or more than 60 inches. In a few areas it has stratified sandy and loamy material in the upper part. In a few places the lower part of the solum and the underlying material have more sand and gravel. In some areas the soil has silt loam glacial till in the underlying material.

Included with this soil in mapping are small areas of the somewhat poorly drained Gilboa soils on the lower parts of the landscape. These soils make up about 5 to 10 percent of the unit.

The available water capacity in the Barce soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is slow. The water table is at a depth of 3 to 4 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface minimize crusting during periods of heavy rainfall. The soil is well suited to a no-till cropping system. Applying animal waste helps to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls, installing a subsurface drainage system, and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Installing foundation drains, excavating the soil and replacing it with better suited material, and using expansion joints also help to prevent this damage. Constructing the buildings on raised, well compacted fill material increases the depth to the seasonal high water table.

Because of frost action and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, conveying runoff to suitable outlets, and crowning the roads and streets minimize the damage caused by frost action and by shrinking and swelling.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is I. No woodland ordination symbol is assigned.

BdB2—Billett sandy loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is along drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 8 inches of very dark grayish brown sandy loam mixed with brown sandy loam from the subsoil. The subsoil is about 31 inches thick. The upper part is brown and dark yellowish brown, friable sandy loam, and the lower part is brown, very friable loamy sand. The underlying material to a depth of about 60 inches is dark yellowish brown, mottled sand that has bands of strong brown loamy sand. In some areas the slope is less than 2 or more than 6 percent. In some small areas the underlying material is at a depth of less than 30 inches. In a few areas, the subsoil has more clay and the soil may have more gravel throughout. In a few places the surface layer is thicker. In some areas it is lighter colored. In other areas the lower part of the underlying material is loam glacial till.

Included with this soil in mapping are some areas of the moderately well drained Ayr Variant and Brems Variant soils. These soils are in landscape positions similar to those of the Billett soil. They are more sandy than the Billett soil. Also included are a few areas of excessively drained, sandy soils that have strata of sandy loam or loamy sand in the lower part and are in landscape positions similar to those of the Billett soil; some areas of the somewhat poorly drained Darroch and Seafield soils on the lower parts of the landscape; and a few areas of moderately well drained or well drained, severely eroded soils on the steeper slopes. Included soils make up about 10 to 15 percent of the unit.

The available water capacity in the Billett soil is moderate. Permeability is moderately rapid in the solum and rapid in the underlying material. Runoff is medium. The water table is at a depth of 3 to 6 feet from late fall to early spring. The organic matter content is low in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion, runoff, and soil blowing are hazards. Also, the soil becomes droughty during the summer. Erosion can be controlled by diversions, terraces, water- and sediment-control basins, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a no-till cropping system. Grassed waterways help to control erosion in the drainageways. A permanent plant cover or a cropping system that includes close-growing crops also helps to control erosion. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage that leaves protective amounts of crop residue on the surface, establishing buffer strips or vegetative barriers, planting cover crops or green manure crops, ridging at an angle to the prevailing wind, or a combination of these measures. A permanent cover of vegetation also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water in the soil.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Erosion, runoff, and soil blowing are the main management concerns. Droughtiness in the summer is a limitation. Overgrazing or grazing when the soil is wet results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion and soil blowing, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suitable as a site for dwellings without basements. Because of the wetness, it is moderately limited as a site for dwellings with basements. Subsurface drains help to lower the water table. Also, building on raised, well compacted fill material helps to prevent the structural damage caused by wetness.

Because of frost action, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action.

Because of a poor filtering capacity and the wetness, this soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water supplies. Filling or mounding with suitable material improves the ability of the absorption field to filter the effluent. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

BeC2—Billett loam, 6 to 12 percent slopes, eroded. This moderately sloping, well drained soil is along narrow drainageways and on slight rises, ridgetops, and knolls in the uplands. Areas are generally irregular in shape and are 3 to 35 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is about 8 inches of dark brown loam mixed with dark yellowish brown loam from the subsoil. The subsoil is about 29 inches thick. The upper part is dark yellowish brown, friable loam. The next part is yellowish brown and brown, friable fine sandy loam. The lower part is brown, very friable sandy loam. The underlying material to a depth of about 60 inches is dark yellowish brown loamy sand that has thin lenses of strong brown loamy fine sand. In some areas the slope is less than 6 or more than 12 percent. In other areas the soil is moderately well drained. In a few areas, the subsoil has more clay and the soil may have more gravel throughout. In a few places the surface layer is lighter colored. In a few areas it is thicker.

Included with this soil in mapping are some scattered small areas of the moderately well drained Ayr Variant and Brems Variant soils and a few scattered areas of excessively drained, sandy soils that have strata of sandy loam or loamy sand in the lower part. Also included are some areas of the somewhat poorly drained Darroch and Seafield soils on the lower parts of the landscape and a few areas of well drained, severely eroded soils on the steeper slopes. Included soils make up about 10 to 15 percent of the unit.

The available water capacity in the Billett soil is moderate. Permeability is moderately rapid in the upper part of the profile and rapid in the underlying material. Runoff is medium. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion, runoff, and soil blowing are hazards. Also, the soil becomes droughty during the summer. Erosion can be controlled by diversions, terraces, water- and sediment-control basins, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a no-till cropping system. Grassed waterways help to control erosion in the drainageways. A permanent plant cover or a cropping system that includes close-growing crops also helps to control erosion. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage, establishing buffer strips or vegetative barriers, planting cover crops or green manure crops, ridging at an angle to the prevailing wind, or a combination of these measures. A permanent cover of vegetation also helps to control soil blowing. Fall-seeded crops can make good use of the limited amount of available water in the soil.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. It is best suited to deep-rooted legumes. Erosion, runoff, and soil blowing are hazards, and droughtiness during the summer is a limitation. Other management concerns are overgrazing and grazing when the soil is too wet. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion and soil blowing, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Additional management practices include harvesting mature trees, excluding livestock, and saving desirable seed trees.

Because of the slope, this soil is moderately limited as a site for dwellings. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Diversions between lots and retaining walls may be needed.

This soil is moderately limited as a site for local roads and streets because of frost action and the slope. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action. Cutting and filling and building the roads on the contour help to overcome the slope.

Because of a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water supplies. Filling or mounding with suitable material improves the ability of the absorption field to filter the effluent. Also, only deep wells should be dug. Grading or land shaping and installing the absorption field on the contour help to overcome the slope.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

BmA—Brems Variant fine sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, moderately well drained soil is on slight rises and ridges in the uplands. Areas are elongated and narrow or are irregular in shape. They are 3 to 35 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is strong brown, very friable fine sandy loam and loamy fine sand. The lower part is yellowish brown and light yellowish brown, mottled, very friable fine sand. The underlying material to a depth of about 60 inches is light yellowish brown and yellowish brown, mottled loamy fine sand. In places the slope is more than 3 percent. In some small areas the underlying material is at a depth of less than 35 inches. In a few areas the solum has less clay.

Included with this soil in mapping are a few areas of the moderately well drained Ayr Variant and well drained Billett soils. These soils are in landscape positions similar to those of the Brems Variant soil. Ayr Variant soils have more clay than the Brems Variant soil. Also included are a few scattered areas of the somewhat poorly drained Seafield soils and other somewhat poorly drained soils on the lower, less sloping parts of the landscape. Included soils make up about 10 to 15 percent of the unit.

The available water capacity in the Brems Variant soil is low or moderate. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Runoff is slow. The water table is at a depth of 2.5 to 4.0 feet during winter and early spring. The organic matter content is low in the surface layer. This layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Soil blowing and drought are hazards. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage that leaves protective amounts of crop residue on the surface, establishing buffer strips or vegetative barriers, planting cover crops or green manure crops, and establishing a permanent cover of vegetation. The soil is well suited to a no-till cropping system. Fall-seeded crops can make good use of the limited amount of available water in the soil.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass and alfalfa, for hay or pasture. Soil blowing and drought are hazards. Overgrazing results in poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Deep-rooted legumes and drought-tolerant species grow better than other species. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control soil blowing, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suitable as a site for dwellings without basements and for local roads and streets. Because of the wetness, it is moderately limited as a site for dwellings with basements. Foundation drains help to lower the water table. Also, building on raised, well compacted fill material helps to prevent the structural damage caused by wetness.

Because of a poor filtering capacity and the wetness, this soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water supplies. Filling or mounding with suitable material improves the ability of the absorption field to filter the effluent. Installing interceptor drains around the absorption field helps to lower the water table.

The land capability classification is IIIs. No woodland ordination symbol is assigned.

Bt—Bryce silty clay. This nearly level, poorly drained soil is in low areas, depressional areas, narrow drainageways, and swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to 500 acres in size. The dominant size is about 90 acres.

Typically, the surface soil is very dark gray silty clay about 18 inches thick. The subsoil is mottled silty clay about 32 inches thick. The upper part is dark gray and olive gray and is firm, and the lower part is light olive gray and very firm. The underlying material to a depth of about 60 inches is gray, mottled silty clay. In some areas the slope is more than 2 percent. In a few areas the solum is browner. In a few places the lower part of the subsoil has less clay and more sand. In some areas the underlying material has less clay. In a few areas the lower part of the solum has less clay. In places the dark surface soil is more than 24 inches thick. In a few areas the lower part of the solum has more sand and gravel. In some areas the underlying material has marl and contains less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Swygert soils on low rises. Also included, on the slightly higher parts of the landscape, are a few scattered areas of somewhat poorly drained soils that have less clay in the upper part of the subsoil than the Bryce soil. Included soils make up about 4 to 7 percent of the unit.

The available water capacity in the Bryce soil is moderate. Permeability is moderately slow or slow in the upper part of the solum and slow or very slow in the lower part and in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface in late winter and in spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. Ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and a ridge-plant tillage system.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing or grazing during wet periods reduces plant density and hardiness, results in surface compaction and poor tilth, damages the sod, and reduces forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the very slow or slow permeability, the ponding, and the shrink-swell potential, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts help to prevent the damage caused by frost action and ponding and improve the traffic-supporting capacity.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Ch—Chalmers silty clay loam. This nearly level, poorly drained soil is in broad low areas, in depressional areas, along and in narrow drainageways, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or long and narrow. They are 3 to more than 500 acres in size. The dominant size is about 200 acres.

Typically, the surface layer is very dark gray silty clay loam about 12 inches thick. The subsoil is about 36 inches thick. The upper part is gray and light brownish gray, mottled, friable silty clay loam. The lower part is gray, mottled, firm loam. The underlying material to a depth of about 60 inches is gray, mottled loam. In places the slope is more than 2 percent. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In many areas the solum has more sand. In some areas the upper part of the underlying material is stratified sandy and loamy material. In a few areas the surface soil is more than 24 inches thick. In a few places the solum or the underlying material has more clay. In some areas the underlying material has more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Conover, Odell, and Lisbon soils on low rises and knolls. These soils make up about 7 to 12 percent of the unit.

The available water capacity in the Chalmers soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. Ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant tillage systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing or grazing during wet periods reduces plant density and hardiness, results in surface compaction and poor tilth, damages the sod, and reduces forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and strengthening or replacing the base with better suited material help to prevent the damage caused by frost action and ponding and improve the traffic-supporting capacity.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Ck—Comfrey silty clay loam, sandy substratum, occasionally flooded. This nearly level, very poorly drained soil is on low bottom land, along streams and creeks, and in old stream channels. It is occasionally flooded for very brief or brief periods and is subject to ponding. Areas are generally elongated, but in places they are irregular in shape. They are 300 to more than 500 acres in size. The dominant size is about 400 acres.

Typically, the surface layer is very dark gray silty clay loam about 6 inches thick. The subsurface layer is about 26 inches of very dark gray silty clay loam and very dark gray, mottled clay loam. The subsoil is dark gray, mottled, friable loam about 14 inches thick. The underlying material to a depth of about 60 inches is dark gray, mottled gravelly coarse sand. In some areas the slope is more than 2 percent. In some small areas the solum has more sand and less clay. In places the surface soil is less than 24 or more than 36 inches thick. In some small areas the depth to the underlying material is less than 40 or more than 55 inches. In some places the underlying material is loamy. In other places it is browner.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils and small areas of somewhat poorly drained soils that are subject to flooding. Both of these included soils are on low rises. Also included are some small areas of the very poorly drained Free soils in the slightly higher positions on the landscape and some small areas of the well drained Rush and Wea and moderately well drained Tippecanoe soils on the higher flats. Included soils make up about 2 to 6 percent of the unit.

The available water capacity in the Comfrey soil is high. Permeability is moderate in the upper part of the profile and very rapid in the underlying material. Runoff is ponded to slow. The water table is near or above the surface during winter and spring. The organic matter content is very high in the surface layer. This layer becomes cloddy and difficult to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Many are used for hay, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. The flooding and the ponding are hazards. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. Levees help to control flooding. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring.

Working this soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to ridge planting.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The flooding and the ponding are hazards. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the flooding and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of the flooding, the ponding, and low strength.

Frost action also is a limitation. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by frost action and ponding and improve the traffic-supporting capacity. Levees help to control flooding. Conveying runoff to suitable outlets minimizes the damage caused by ponding and frost action.

The land capability classification is IIIw. No woodland ordination symbol is assigned.

Cm—Comfrey silty clay loam, sandy substratum, frequently flooded. This nearly level, very poorly drained soil is on low bottom land, along streams and creeks, and in old stream channels. It is frequently flooded for very brief or brief periods (fig. 7). It is subject to ponding. Areas are elongated or are irregular in shape. They are 300 to more than 500 acres in size. The dominant size is about 400 acres.

Typically, the surface layer is black silty clay loam about 12 inches thick. The subsurface layer is about 19 inches of very dark gray silty clay loam, loam, and mottled clay loam. The subsoil is about 19 inches thick. The upper part is dark gray, mottled, friable clay loam. The lower part is gray, mottled, friable clay loam and loam. The underlying material to a depth of about 60 inches is dark grayish brown, mottled gravelly sand. In some places the slope is more than 2 percent. In many small areas the solum has more sand and less clay. In

Figure 7.—An area of Comfrey silty clay loam, sandy substratum, frequently flooded.

some areas the surface soil is less than 24 or more than 36 inches thick. In some small areas the underlying material is at a depth of less than 40 or more than 55 inches. In places it is loamy or is browner.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils on low rises and some small areas of the very poorly drained Free soils on the slightly higher parts of the landscape that are not subject to flooding. Also included are some small areas of the well drained Rush and Wea and moderately well drained Tippecanoe soils on the higher flats. Included soils make up about 2 to 6 percent of the unit.

The available water capacity in the Comfrey soil is high. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and difficult to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for pasture, woodland, or wildlife habitat. Some are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain. The flooding and ponding are hazards. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth.

This soil is generally unsuited to grasses and legumes for hay. It is poorly suited to pasture. The best suited pasture species are reed canarygrass and birdsfoot trefoil. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted species. The flooding and the ponding are hazards. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the flooding and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of the flooding, the ponding, and low strength. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and strengthening or replacing the base with better suited material help to remove excess water, prevent the damage caused by shrinking and swelling, and improve the traffic-supporting capacity. Levees help to control flooding.

The land capability classification is Vw. No woodland ordination symbol is assigned.

CpA—Conover silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is in low areas, along and in drainageways, and on low rises in the uplands. Areas are irregular in shape and are 3 to 175 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 22 inches thick. It is mottled. The upper part is brown, friable silt loam. The next part is brown and yellowish brown, friable clay loam. The lower part is yellowish brown, friable loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the soil has a slope of more than 3 percent and is moderately eroded. In some small areas the underlying material is at a depth of less than 24 or more than 40 inches. In a few places the surface layer is thicker. In many places it is lighter colored. In some areas the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are a few small areas of the moderately well drained Montmorenci and well drained Miami soils on slight rises. Also included are some areas of the poorly drained Chalmers soils in depressions. Included soils make up about 6 to 10 percent of the unit.

The available water capacity in the Conover soil is high. Permeability is moderately slow. Runoff is slow. The water table is at a depth of 1 to 2 feet from late fall to late spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. The root zone is shallow because excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a till-plant cropping system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Additional management practices include harvesting mature trees, excluding livestock, and saving desirable seed trees.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains help to lower the water table. Also, building on raised, well compacted fill material helps to prevent the damage caused by wetness.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. The woodland ordination symbol is 4A.

CsA—Corwin silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is in broad areas and on low rises and ridgetops in the uplands. Areas are dominantly irregular in shape and are 3 to 140 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is about 3 inches of dark brown loam. The subsoil is about 23 inches thick. The upper part is dark yellowish brown, friable clay loam. The next part is yellowish brown, mottled, friable clay loam. The lower part is light olive brown, mottled, friable loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is more than 40 inches. In many small areas the upper part of the subsoil has more sand and gravel. In a few places the surface layer is lighter colored or thinner. In some areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are areas of the somewhat poorly drained Lisbon and Odell soils on the lower parts of the landscape. Also included are small areas of the very poorly drained Wolcott soils in depressions. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Corwin soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 2 to 4 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content. They also help to prevent surface crusting after periods of heavy rainfall. The soil is well suited to till-plant and no-till cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted suitable fill material increases the depth to the water table.

Because of the shrink-swell potential, low strength, and the wetness, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling, low strength, and wetness and improve the traffic-supporting capacity.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is I. No woodland ordination symbol is assigned.

CsB2—Corwin silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is along drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is about 11 inches of very dark grayish brown silt loam mixed with yellowish brown clay loam from the subsoil. The subsoil is friable clay loam about 19 inches thick. The upper part is yellowish brown, and the lower part is dark yellowish brown and brown and is mottled. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In a few places the subsoil has less sand and more silt. In some areas the slope is less than 2 or more than 6 percent. In many small areas the depth to the underlying material is less than 24 inches, and in a few areas it is more than 40 inches. In many small areas the upper part of the subsoil has more sand and gravel. In many places the surface layer is lighter colored or thinner. In some areas the upper part of the underlying material is stratified sandy and loamy material. In other areas the soil is more eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Lisbon and Odell soils on the lower parts of the landscape. Also included are small areas of the very poorly drained Wolcott soils in depressions. Included soils make up about 7 to 12 percent of the unit.

The available water capacity in the Corwin soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 2 to 4 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to till-plant and no-till cropping systems. Grassed waterways help to control erosion in the drainageways. A permanent plant cover or a cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, a system of conservation tillage that leaves all or part of the crop residue on the surface, and applications of animal waste help to prevent crusting after periods of heavy rainfall and help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of the shrink-swell potential, the wetness, and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling, low strength, and wetness and improve the traffic-supporting capacity.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

CsC2—Corwin silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately well drained soil is along drainageways and on long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 70 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark grayish brown silt loam about 6 inches thick. The subsurface layer is about 5 inches of dark brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is about 19 inches of dark yellowish brown, friable clay loam. The upper part of the underlying material is brown and yellowish brown, mottled loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam and silt loam. In some areas the slope is less than 6 or more than 12 percent. In many small areas the underlying material is at a depth of less than 24 inches. In a few areas the upper part of the subsoil has more sand and gravel. In many places the surface layer is lighter colored or thinner. In a few areas the upper part of the underlying material is stratified sandy and loamy material. In a few places the subsoil and underlying material have more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Lisbon and Odell soils on the lower parts of the landscape. Also included are small areas of the very poorly drained Wolcott soils in depressions. Included soils make up about 4 to 7 percent of the unit.

The available water capacity in the Corwin soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 2 to 4 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas are used for hay, pasture, or cultivated crops. This soil is suited to corn, soybeans, and small grain. Erosion is a hazard. It can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a cropping system that includes close-growing crops. The soil is well suited to till-plant and no-till cropping systems. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Conservation tillage, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing increases the susceptibility to erosion and reduces plant density and hardiness. Grazing during wet periods causes surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. A permanent cover of grasses and legumes helps to slow runoff and control erosion. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the shrink-swell potential, the wetness, and the slope, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Diversions between lots and retaining walls may be needed.

Because of low strength, the wetness, and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength, wetness, and shrinking and swelling and improve the traffic-supporting capacity.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

Ct—Crane silt loam. This nearly level, somewhat poorly drained soil is along drainageways and on broad terraces and low rises. Areas are irregular in shape and are 3 to 550 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer is about 5 inches of very dark gray loam. The subsoil is about 38 inches thick. It is mottled. The upper part is yellowish brown and dark yellowish brown, friable clay loam. The lower part is dark yellowish brown and brown, friable gravelly sandy clay loam. The underlying material to a depth of about 60 inches is pale brown very gravelly loamy coarse sand. In some places the upper part of the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In a few areas, the solum has less gravel and the underlying material is stratified sandy and loamy material. In some areas the lower part of the underlying material has more clay and less sand and gravel.

Included with this soil in mapping are small areas of the well drained Rush and Wea soils on slight rises. Also included are a few areas of the poorly drained Drummer and very poorly drained Free soils in depressions and the very poorly drained Comfrey soils on flood plains. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Crane soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Excess water is a limitation. Crusting is a problem. The root zone is shallow because the excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a till-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings and septic tank absorption fields. Installing interceptor drains around the absorption fields and a foundation drainage system on building sites lowers the water table. Also, constructing the buildings on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and strengthening or replacing the base with better suited material minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Cu—Crane loam, till substratum. This nearly level, somewhat poorly drained soil is along and in drainageways, in broad low areas, and on low rises in the uplands. Areas are irregular in shape and are 3 to 125 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark gray loam about 11 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is brown, friable loam and silt loam. The lower part is light yellowish brown and brown, friable fine sandy loam. The upper part of the underlying material is yellowish brown, mottled gravelly coarse sand. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In some places the upper part of the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In a few places the surface layer is thinner. In some areas, the solum has less gravel and the underlying material is stratified sandy and loamy material. In many places the underlying material is either very gravelly loamy coarse sand or loam throughout.

Included with this soil in mapping are small areas of the well drained Rush and Wea soils on slight rises. Also included are a few areas of the poorly drained Drummer and very poorly drained Free soils in depressions and the very poorly drained Comfrey soils on flood plains. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Crane soil is moderate. Permeability is moderate in the solum, very rapid in the upper part of the underlying material, and moderately slow in the lower part. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Excess water is a limitation. Crusting is a problem. The root zone is shallow because the excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a till-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table. Because of frost action, the soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Do—Darroch silt loam. This nearly level, somewhat poorly drained soil is on broad flats and low rises in the uplands. Areas are generally irregular in shape and are 3 to 100 acres in size. The dominant size is about 15 acres.

Typically, the surface soil is very dark gray silt loam about 15 inches thick. The subsoil is about 14 inches of grayish brown, mottled, friable silty clay loam and loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled, stratified silt loam and fine sand. In some places the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In a few areas it contains more sand and gravel throughout. In some small areas the depth to the underlying material is less than 24 inches. In many areas it is more than 40 inches. In a few places the surface layer is lighter colored or thinner. In places the lower part of the underlying material is loam or silty clay loam. In a few areas glacial till is within a depth of 60 inches.

Included with this soil in mapping are areas of the well drained Billett and moderately well drained Foresman soils on the higher rises. Also included are a few areas of the poorly drained Selma soils in depressions. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Darroch soil is high. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a till-plant cropping system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Wetness and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table. The soil is severely limited as a site for local roads and streets because of frost action. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Dp—Darroch silt loam, till substratum. This nearly level, somewhat poorly drained soil is in broad areas and on low rises in the uplands. Areas are irregular in shape and are 3 to 200 acres in size. The dominant size is about 15 acres.

Typically, the surface soil is very dark grayish brown silt loam about 13 inches thick. The subsoil is about 18 inches thick. It is mottled and friable. The upper part is brown loam, and the lower part is yellowish brown clay loam. The upper part of the underlying material is gray and light olive brown, mottled, stratified silt loam, sand, fine sand, very fine sandy loam, and loam. The lower part to a depth of about 60 inches is yellowish brown, mottled loam. In a few places the subsoil has less sand and more silt. In some areas the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few places the underlying material is stratified sandy and loamy material. In a few areas the surface layer is lighter colored or thinner. In some areas, the solum is thicker and the underlying material has more gravel. In a few places the underlying material has more clay and less sand.

Included with this soil in mapping are small areas of the well drained Billett and moderately well drained Foresman soils on the higher rises. Also included are a few areas of the poorly drained Selma soils in depressions. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Darroch soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a till-plant cropping system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Dr—Darroch silt loam, moderately fine substratum. This nearly level, somewhat poorly drained soil is on broad flats and low rises in the uplands. Areas are irregular in shape and are 3 to 35 acres in size. The dominant size is about 10 acres.

Typically, the surface soil is black silt loam about 11 inches thick. The subsoil is mottled, friable clay loam about 19 inches thick. The upper part is brown, and the lower part is grayish brown. The upper part of the underlying material is grayish brown, mottled, stratified silt loam, fine sand, fine sandy loam, and sand. The lower part to a depth of about 60 inches is light brownish gray, mottled silty clay loam. In some areas the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few places the surface layer is lighter colored or thinner. In some areas the underlying material has more sand and gravel in the upper part. In other areas it has more clay and less sand.

Included with this soil in mapping are small areas of the well drained Billett soils, the moderately well drained Foresman soils, and moderately well drained soils that are silty clay loam in the underlying material. All of these included soils are on the higher rises. Also included are a few areas of the poorly drained Selma soils in depressions. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Darroch soil is high. Permeability is moderate in the solum, moderately slow in the upper part of the underlying material, and moderately slow or slow in the lower part. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a till-plant cropping system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow or slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Du—Drummer silty clay loam. This nearly level, poorly drained soil is in broad low areas, in depressional areas, along and in narrow drainageways, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or are long and narrow. They are 3 to more than 500 acres in size. The dominant size is about 200 acres.

Typically, the surface layer is very dark gray silty clay loam about 10 inches thick. The subsurface layer is about 4 inches of black, mottled silty clay loam. The subsoil is about 39 inches thick. It is gray and mottled. The upper part is firm silty clay loam, the next part is friable silty clay loam, and the lower part is friable silt loam. The underlying material to a depth of about 60 inches is light gray, mottled silt loam. In some areas the slope is more than 2 percent. In a few places the lower part of the solum and the underlying material do not have coarser textured strata. In some areas the solum has more gravel or more clay. In some small areas the depth to the underlying material is less than 42 or more than 65 inches. In a few places the underlying material has more sand. In some areas the solum has more sand. In other areas the surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils on low rises and the slightly higher parts of the landscape. Also included are small areas of the very poorly drained Houghton soils in the lower depressions. Included soils make up about 6 to 10 percent of the unit.

The available water capacity in the Drummer soil is high. Permeability is moderate. Runoff is ponded or very slow. The water table is near or above the surface in late winter and in spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to prevent puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant cropping systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by ponding, frost action, and low strength and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Dv—Drummer silty clay loam, gravelly substratum. This nearly level, poorly drained soil is in broad low depressions, in drainageways, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 300 acres.

Typically, the surface soil is very dark gray silty clay loam about 16 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is very dark grayish brown, friable silty clay loam. The next part is gray, friable and firm silty clay loam. The lower part is gray, friable silt loam. The underlying material to a depth of about 60 inches is grayish brown gravelly loamy coarse sand. In some areas the slope is more than 2 percent. In a few places the solum has more gravel or more clay. In some small areas the depth to the underlying material is less than 42 or more than 65 inches. In places the underlying material is not stratified. In a few places the surface soil is more than 24 inches thick. In a few areas the underlying material has more sand. In some areas the solum has sand.

Included with this soil in mapping are some areas of the somewhat poorly drained Crane soils on low rises and the slightly higher parts of the landscape. Also included are small areas of the very poorly drained Houghton soils in the lower depressions. Included soils make up about 5 to 12 percent of the unit.

The available water capacity in the Drummer soil is high. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface in late winter and in spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant cropping systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by ponding, low strength, and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Dx—Drummer silty clay loam, stratified sandy substratum. This nearly level, poorly drained soil is along and in narrow drainageways, in broad low areas, in depressional areas, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to more than 500 acres in size. The dominant size is about 160 acres.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is about 4 inches of very dark gray silty clay loam. The subsoil is about 39 inches thick. It is mottled. The upper part is very dark gray and gray, firm silty clay loam. The next part is grayish brown and light brownish gray, firm silty clay loam. The lower part is gray, friable silt loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled sand that has strata of silt loam, very fine sandy loam, and fine sand. In a few places the solum has more gravel or more clay. In some places the subsoil has more sand and less silt. In other places the slope is more than 2 percent. In a few areas the underlying material has less sand or is not stratified. In some small areas the depth to the underlying material is less than 42 or more than 65 inches. In some areas the underlying material is loam or silt loam glacial till. In some small areas the surface soil is more than 24 inches thick. In places the soil has shell fragments or marl within a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils. These soils are on low rises and the slightly higher parts of the landscape. Also included are small areas of the very poorly drained Houghton soils in the lower depressions. Included soils make up about 6 to 11 percent of the unit.

The available water capacity in the Drummer soil is high. Permeability is moderate. Runoff is ponded or very slow. The water table is near or above the surface in late winter and in spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant cropping systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay and pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by ponding, low strength, and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

ElA—Elliott silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is along and in drainageways, in low areas, and on low rises in the uplands. Areas are irregular in shape and are 3 to 125 acres in size. The dominant size is about 15 acres.

Typically, the surface soil is black silt loam about 13 inches thick. The subsoil is mottled, friable silty clay loam about 26 inches thick. The upper part is brown, the next part is yellowish brown, and the lower part is light yellowish brown. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In places the solum has less sand and more silt. In some small areas the upper part of the subsoil has less clay and more sand and gravel. In some areas the soil has a slope of more than 2 percent and is moderately eroded. In a few places the solum has less clay. In some small areas the depth to the underlying material is less than 20 inches. In a few areas the subsoil has more clay. In some areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the moderately well drained Markham and Varna soils on slight rises and the higher parts of the landscape and some areas of the poorly drained Ashkum soils in depressions. Also included, on slight rises and the higher parts of the landscape, are small areas of moderately well drained soils that have more sand and gravel and less clay in the subsoil than the Elliott soil. Included soils make up about 7 to 14 percent of the unit.

The available water capacity in the Elliott soil is high. Permeability is moderately slow in the solum and moderately slow or slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet in late winter and in spring. The organic matter content is high in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. Surface drains, subsurface drains, or a combination of these can remove the excess water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and ridge planting.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Building the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow or slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

ElB2—Elliott silt loam, 2 to 4 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is along and in drainageways and on broad flats, rises, knolls, long side slopes, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 400 acres in size. The dominant size is about 25 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with dark yellowish brown silty clay loam from the subsoil. The subsoil is about 23 inches thick. It is mottled. The upper part is dark yellowish brown, friable silty clay loam. The next part is yellowish brown, firm silty clay. The lower part is yellowish brown, firm silty clay loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled silty clay loam. In places the slope is less than 2 or more than 4 percent. In some small areas the depth to the underlying material is less than 20 inches. In a few areas the subsoil or the solum has more clay. In some small areas the upper part of the subsoil has less clay and more sand and gravel. In many places the surface layer is thinner. In some areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the moderately well drained Markham and Varna soils on slight rises and the higher parts of the landscape and some areas of the poorly drained Ashkum soils in depressions. Also included, on slight rises and the higher parts of the landscape, are small areas of moderately well drained soils that have more sand and gravel and less clay in the subsoil than the Elliott soil. Included soils make up about 7 to 14 percent of the unit.

The available water capacity in the Elliott soil is high. Permeability is moderately slow in the solum and moderately slow or slow in the underlying material. Runoff is medium. The water table is at a depth of 1 to 3 feet in late winter and in spring. The organic matter content is high in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards, and excess water is a limitation. Crusting is a problem. The root zone is shallow because the excess water hinders root growth. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to fall chiseling and ridge planting. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Excess water can be removed by surface drains, subsurface drains, or a combination of these.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Erosion and runoff are hazards, and excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow or slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

FoB2—Foresman silt loam, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, moderately well drained soil is along drainageways and on rises, long side slopes, knolls, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is about 29 inches thick. The upper part is dark yellowish brown, friable clay loam. The next part is dark yellowish brown, mottled, friable sandy clay loam. The lower part is brown and grayish brown, mottled, friable clay loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silt loam that has strata of sand. In places the subsoil has less sand and more silt. In a few places the underlying material has more clay and less sand. In some areas the slope is less than 1 or more than 5 percent. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the subsoil has less clay. In a few places the surface layer is lighter colored or thinner. In some areas the subsoil has less sand and more silt. In other areas the underlying material has more sand and gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Darroch soils. Also included are other somewhat poorly drained soils that have less sand in the subsoil than the Foresman soil.

Both of the included soils are on the lower parts of the landscape. They make up about 6 to 13 percent of the unit.

The available water capacity in the Foresman soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 3 to 6 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to till-plant and no-till cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Building on raised, well compacted fill material increases the depth to the water table and minimizes the damage caused by shrinking and swelling.

Because of frost action, the shrink-swell potential, and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling, low strength, and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

FpB2—Foresman silt loam, till substratum, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, moderately well drained soil is along drainageways and on rises, long side slopes, knolls, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 80 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with dark yellowish brown loam from the subsoil. The subsoil is about 26 inches thick. It is friable. The upper part is dark yellowish brown loam. The next part is yellowish brown, mottled clay loam. The lower part is yellowish brown, mottled loam that has strata of fine sandy loam and clay loam. The upper part of the underlying material is light yellowish brown, mottled silt loam that has strata of sand, fine sand, and very fine sand. The lower part to a depth of about 60 inches is yellowish brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 1 or more than 5 percent. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the subsoil has less clay. In a few places the surface layer is lighter colored or is thinner. In some areas the subsoil has less sand and more silt. In a few places the underlying material has more clay and less sand. In some areas the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the somewhat poorly drained Darroch soils on the lower parts of the landscape and a few areas of moderately well drained, severely eroded soils on the steeper slopes. Also included, on the lower parts of the landscape, are small areas of somewhat poorly drained soils that have less sand in the subsoil than the

Foresman soil. Included soils make up about 6 to 13 percent of the unit.

The available water capacity in the Foresman soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 3 to 6 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Building on raised, well compacted fill material increases the depth to the water table and minimizes the damage caused by shrinking and swelling.

Because of frost action, the shrink-swell potential, and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling, low strength, and frost action and improve the traffic-supporting capacity.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

FrB2—Foresman loam, moderately fine substratum, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, moderately well drained soil is along drainageways and on rises, long side slopes, knolls, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 35 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is friable clay loam about 24 inches thick. The upper part is dark yellowish brown and yellowish brown, and the lower part is brown and grayish brown and is mottled. The upper part of the underlying material is yellowish brown, mottled sandy loam that has strata of sand and loamy sand. The lower part to a depth of about 60 inches is light olive brown, mottled silty clay loam. In some areas the slope is less than 1 or more than 5 percent. In a few places the underlying material has more clay and less sand. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the subsoil has less clay. In a few places the surface layer is lighter colored or is thinner. In some areas the underlying material is silty clay loam glacial till. In other areas the subsoil has more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Darroch soils on the lower parts of the landscape and a few areas of moderately well drained, severely eroded soils on the steeper slopes. Included soils make up about 6 to 12 percent of the unit.

The available water capacity in the Foresman soil is high. Permeability is moderate in the solum, moderately slow in the upper part of the underlying material, and moderately slow or slow in the lower part. Runoff is medium. The water table is at a depth of 3 to 6 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Building on raised, well compacted fill material increases the depth to the water table and minimizes the damage caused by shrinking and swelling.

Because of frost action, the shrink-swell potential, and low strength, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling, low strength, and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

Because of the moderately slow or slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Ft—Free clay loam. This nearly level, very poorly drained soil is in low areas, in depressions, along and in narrow drainageways, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or are long and narrow. They are 3 to 450 acres in size. The dominant size is about 50 acres.

Typically, the surface soil is black clay loam about 16 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is dark gray, friable clay loam and loam. The next part is gray, friable gravelly loam. The lower part is gray, very friable gravelly sandy loam. The underlying material to a depth of about 60 inches is brown, mottled very gravelly loamy coarse sand. In some places the solum has less sand and more silt. In other places the slope is more than 2 percent. In a few areas the lower part of the solum and the underlying material have less gravel. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In places the soil has more clay. In a few areas the lower part of the underlying material is loam glacial till. In some areas the surface soil is more than 24 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils on low rises and a few small areas of the well drained Wea soils on the highest rises. Also included are small areas of the very poorly drained Comfrey soils on flood plains. Included soils make up about 3 to 10 percent of the unit.

The available water capacity in the Free soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding hinders the use of farm equipment. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. If a drainage outlet is available, this water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant cropping systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action and ponding. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

GlA—Gilboa silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is along and in drainageways, in low areas, and on low rises in the uplands. Areas are irregular in shape and are 3 to 200 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark grayish brown silt loam about 2 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is dark yellowish brown, friable silty clay loam. The next part is yellowish brown, friable loam. The lower part is light olive brown, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the solum has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In a few areas the lower part of the solum and the underlying material have more clay. In places they have more sand and gravel. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In many small areas the upper part of the subsoil has less sand and gravel.

Included with this soil in mapping are small areas of the very poorly drained Wallkill Variant and poorly drained Selma soils in depressions. Also included are some areas of the moderately well drained Barce soils on the higher parts of the landscape. Included soils make up about 10 to 13 percent of the unit.

The available water capacity in the Gilboa soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is a limitation. Crusting is a problem. The root zone is shallow because excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a till-plant cropping system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of the wetness, frost action, and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling and by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by excess water and frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

GlB—Gilboa silt loam, 2 to 4 percent slopes. This gently sloping, somewhat poorly drained soil is along and in narrow drainageways and on low rises, long side slopes, and knolls in the uplands. Areas are irregular in shape and are 3 to 80 acres in size. The dominant size is about 15 acres.

Typically, the surface soil is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is brown, friable clay loam. The next part is grayish brown, friable clay loam. The lower part is light olive brown, firm loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In a few places the solum has less sand and more silt. In some areas the slope is less than 2 or more than 4 percent. In a few areas the lower part of the solum and the underlying material have more clay. In places they have more sand and gravel. In many small areas the soil is moderately eroded. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In a few areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the very poorly drained Wallkill Variant and poorly drained Selma soils in depressions. Also included, on the higher parts of the landscape, are some areas of the moderately well drained Barce soils and soils having a surface layer that is lighter colored or thinner than that of the Gilboa soil. Included soils make up about 9 to 13 percent of the unit.

The available water capacity in the Gilboa soil is high. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 1 to 3 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards, and excess water is a limitation. Crusting is a problem. The root zone is shallow because excess water hinders root growth. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to a till-plant cropping system. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Excess water can be removed by surface drains, subsurface drains, or a combination of these.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Erosion and runoff are hazards, and excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of the wetness, frost action, and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by excess water and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by excess water and frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Ho—Houghton muck. This nearly level, very poorly drained soil is along and in narrow drainageways and in low areas, depressional areas, and swales on uplands (fig. 8). It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to 225 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is black muck about 9 inches thick. Below this to a depth of about 60 inches is black, very dark brown, and dark brown, friable muck. In some areas the slope is more than 2 percent. In a few areas the surface layer is loam or silt loam. In many small areas the soil has marl or sandy and loamy material at a depth of 16 to 50 inches.

Included with this soil in mapping are some small areas of the poorly drained Drummer soils and a few areas of somewhat poorly drained soils. Both of the included soils are on slight rises, mainly around the edge of the mapped areas. They make up about 4 to 8 percent of the unit.

The available water capacity in the Houghton soil is very high. Permeability is moderately slow to moderately rapid. Runoff is ponded or very slow. The water table is near or above the surface during fall, winter, and spring.

Figure 8.—An area of Houghton muck. Wallkill Variant soils are in the background.

The organic matter content is very high in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas are used for cultivated crops. This soil is fairly well suited to corn and soybeans. Soil blowing and ponding are hazards, and cold soil temperatures and subsidence of the muck are limitations. Also, the muck can burn. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. Management of the water table depth determines the oxidation rate of the muck. Excessive drainage increases this rate. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage that leaves protective amounts of crop residue on the surface, establishing buffer strips or vegetative barriers, ridging at an angle to the prevailing wind, or a combination of these. Excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. The soil should be plowed only in the spring.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. Soil blowing and ponding are hazards. Frost heaving is a limitation. Other management concerns are overgrazing and grazing when the soil is wet. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to maintain good plant density and hardiness and help to keep the pasture in good condition.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only when the ground is frozen. Water-tolerant species should be selected for planting. Planting more trees than is necessary can compensate for seedling mortality, but thinning may be required after the trees are established. The seedling mortality rate can be reduced by planting containerized nursery stock or large trees. Carefully thinning the stands or not thinning them at all and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Unwanted trees and shrubs can be controlled by proper site preparation and by spraying, cutting, or girdling. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of low strength and ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Removing the unstable material, constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by excess water, low strength, and frost action and improve the traffic-supporting capacity. Pilings are necessary in some areas. Conveying runoff to suitable outlets minimizes the damage caused by ponding and frost action.

The land capability classification is IIIw. The woodland ordination symbol is 2W.

LsA—Lisbon silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is along and in drainageways, in broad low areas, and on low rises in the uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 25 acres.

Typically, the surface soil is very dark gray silt loam about 12 inches thick. The subsoil is mottled silty clay loam about 26 inches thick. The upper part is dark grayish brown and friable, the next part is brown and firm, and the lower part is light olive brown and firm. The underlying material to a depth of about 60 inches is light olive brown, mottled silt loam. In some places the subsoil has less silt and more sand. In other places the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 24 or more than 42 inches. In a few places the subsoil has more clay. In some areas the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the moderately well drained Corwin soils on the higher rises. Also included are a few areas of the poorly drained Chalmers soils in depressions. Included soils make up about 5 to 11 percent of the unit.

The available water capacity in the Lisbon soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during fall, winter, and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is a limitation. Crusting is a problem. The root zone is shallow because excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to chiseling and to a till-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

MbB2—Markham silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is in broad areas along drainageways and on high rises, long side slopes, ridgetops, and knolls in the uplands. Areas are dominantly irregular in shape and are 3 to 300 acres in size. The dominant size is about 40 acres.

Typically, the surface layer is about 8 inches of very dark grayish brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is about 26 inches thick. It is yellowish brown. The upper part is friable silty clay loam; the next part is mottled, firm silty clay; and the lower part is mottled, firm silty clay loam. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In some areas the slope is less than 2 or more than 6 percent. In some small areas the depth to the underlying material is less than 20 inches. In many places the surface layer is thicker. In some areas the upper part of the subsoil has less clay and more sand and gravel. In other areas the soil is severely eroded. In places the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are areas of the somewhat poorly drained Elliott soils on the slightly lower parts of the landscape. Also included are small areas of the poorly drained Ashkum soils in depressions. Included soils make up about 5 to 12 percent of the unit.

The available water capacity in the Markham soil is high. Permeability is moderately slow or slow. Runoff is medium. The water table is at a depth of 3 to 6 feet in late winter and in spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A conservation tillage system that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

Because of the moderately slow or slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. The woodland ordination symbol is 4A.

MlB2—Miami silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is along narrow drainageways and on slight rises, side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 7 inches of brown silt loam mixed with yellowish brown silt loam from the subsoil. The subsoil is about 23 inches thick. It is yellowish brown and friable. The upper part is silt loam, the next part is clay loam, and the lower part is loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 2 or more than 6 percent. In a few places the lower part of the subsoil has gray mottles. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the upper part of the subsoil has more sand and gravel. In a few places the surface layer is darker. In some areas the soil is severely eroded. In some small areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the somewhat poorly drained Conover soils. Also included are small areas of somewhat poorly drained soils that have more sand in the subsoil than the Miami soil. Both of the included soils are in the slightly lower or less sloping areas. They make up about 5 to 10 percent of the unit.

The available water capacity in the Miami soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to the no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling.

Because of frost action and the shrink-swell potential, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by shrinking and swelling and by frost action. Conveying runoff to suitable outlets minimizes the damage caused by frost action, and crowning the roads minimizes the damage caused by shrinking and swelling.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 5A.

MlD2—Miami silt loam, 12 to 20 percent slopes, eroded. This strongly sloping and moderately steep, well drained soil is along narrow drainageways and on long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is about 7 inches of dark brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is about 22 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, the next part is mottled clay loam, and the lower part is mottled loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 12 or more than 20 percent. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the upper part of the subsoil has more sand and gravel. In a few places the surface layer is darker. In some areas the soil is severely eroded. In some small areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the somewhat poorly drained Conover soils. Also included are somewhat poorly drained soils that have more sand in the subsoil than the Miami soil. Both of the included soils are in the slightly lower or less sloping areas. They make up about 5 to 10 percent of the unit.

The available water capacity in the Miami soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is rapid. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for hay or pasture. Some are used for cultivated crops or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting and the slope are problems. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops or a permanent cover of grasses and legumes also helps to control erosion. Careful use of farm equipment is required on these slopes.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to a no-till cropping system.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay and is well suited to pasture. Erosion and runoff are hazards. Operating some types of farm equipment can be hazardous on the steeper slopes. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the slope and the moderately slow permeability, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads and streets because of the slope. Land shaping and constructing the roads on the contour help to overcome this limitation.

The land capability classification is IVe. The woodland ordination symbol is 5A.

MmC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, well drained soil is along narrow drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are generally irregular in shape and are 3 to 45 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is about 8 inches of brown, mottled clay loam mixed with yellowish brown clay loam from the subsoil. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is about 20 inches thick. It is yellowish brown, mottled, and friable. The upper part is clay loam, and the lower part is loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some areas the slope is less than 6 or more than 12 percent. In many small areas the underlying material is within a depth of 24 inches. In a few small areas, it has been mixed with the subsoil by plowing and the surface layer is yellowish brown, cloddy, calcareous loam. In a few places the lower part of the subsoil has gray mottles. In a few areas the upper part of the subsoil has more sand and gravel. In a few places the surface layer is dark. In some areas the soil is not so eroded. In some small areas the upper part of the underlying material has stratified sandy and loamy material.

Included with this soil in mapping are some small areas of the somewhat poorly drained Conover soils. Also included are somewhat poorly drained soils that have more sand in the subsoil than the Miami soil. Both of the included soils are in the slightly lower or less sloping areas. They make up about 4 to 7 percent of the unit.

The available water capacity in the Miami soil is moderate. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Runoff is rapid. The organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A permanent cover of grasses and legumes or a cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These measures and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is fairly well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay. It is well suited to pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is too wet. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. The main management concern is plant competition. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Additional management practices include harvesting mature trees, excluding livestock, and saving desirable seed trees.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarse textured material, excavating the soil and replacing it with better suited material, and using expansion joints help to prevent the structural damage caused by shrinking and swelling. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Diversions between lots and retaining walls may be needed.

Because of frost action, the shrink-swell potential, and the slope, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action. Crowning the roads minimizes the damage caused by shrinking and swelling. Cutting and filling and building the roads on the contour help to overcome the slope.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

The land capability classification is IVe. The woodland ordination symbol is 5A.

MuB3—Montmorenci loam, 2 to 6 percent slopes, severely eroded. This gently sloping, moderately well drained soil is along drainageways and on broad rises, long side slopes, ridgetops, and knolls in the uplands.

Areas are irregular in shape and are 3 to 20 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is about 8 inches of very dark grayish brown loam mixed with yellowish brown clay loam from the subsoil. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is about 20 inches thick. It is friable. The upper part is yellowish brown clay loam. The next part is yellowish brown, mottled clay loam. The lower part is brown, mottled loam. The underlying material to a depth of about 60 inches is yellowish brown, mottled loam. In some areas it is silt loam glacial till. In other areas the slope is less than 2 or more than 6 percent. In many small areas the depth to the underlying material is less than 24 inches. In some places the subsoil has more clay. In other places the upper part of the subsoil has more sand and gravel. In some areas the underlying material is stratified sandy and loamy material. In other areas the soil is only moderately eroded.

Included with this soil in mapping are areas of the somewhat poorly drained Conover soils on the slightly lower or less sloping parts of the landscape and a few areas of the very poorly drained Peotone soils in depressions or potholes. Also included, in the slightly lower or less sloping areas, are somewhat poorly drained soils that have more sand in the subsoil than the Montmorenci soil. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Montmorenci soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 2.5 to 6.0 feet during late winter and early spring. The organic matter content is moderate in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops or a permanent cover of grasses and legumes also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These practices and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Other management concerns are overgrazing and grazing when the soil is wet. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

MxB2—Montmorenci silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is along drainageways, in broad areas, and on high rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 200 acres in size. The dominant size is about 40 acres.

Typically, the surface layer is about 8 inches of very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is about 24 inches thick. The upper part is dark yellowish brown and yellowish brown, friable clay loam. The next part is yellowish brown, mottled, friable clay loam. The lower part is brown, mottled, firm loam. The underlying material to a depth of about 60 inches is brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the slope is less than 2 or more than 6 percent. In some areas the underlying material is loam glacial till. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In many places the surface layer is thicker or lighter colored. In some areas the upper part of the subsoil has more sand and gravel. In other areas the underlying material is stratified sandy and loamy material. In places the subsoil has more clay.

Included with this soil in mapping are areas of the somewhat poorly drained Conover soils on the slightly lower parts of the landscape. Also included are a few areas of the very poorly drained Peotone soils in depressions or potholes. Included soils make up about 8 to 13 percent of the unit.

The available water capacity in the Montmorenci soil is moderate. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is medium. The water table is at a depth of 2.5 to 6.0 feet during late winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These practices and applications of animal waste improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

Because of the moderately slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

OIA—Odell silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is along and in drainageways and on low flats and rises in the uplands. Areas are irregular in shape and are 3 to 300 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsoil is about 20 inches thick. It is friable. The upper part is brown silt loam. The lower part is dark brown, mottled clay loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some places the subsoil has less sand and more silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In some small areas the depth to the underlying material is less than 24 or more than 40 inches. In a few areas the underlying material is silt loam glacial till. In some areas the surface layer is thinner. In a few areas the upper part of the subsoil has more sand and gravel.

In a few places the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the moderately well drained Corwin soils on slight rises. Also included are areas of the poorly drained Chalmers and very poorly drained Wolcott soils in depressions. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Odell soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a till-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

OIB2—Odell silt loam, 2 to 4 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is along and in drainageways and on broad flats, rises, knolls, long side slopes, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 500 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with yellowish brown loam from the subsoil. The subsoil is about 18 inches thick. It is friable. The upper part is yellowish brown loam. The lower part is brown and yellowish brown, mottled clay loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam. In some areas the slope is less than 2 or more than 4 percent. In a few areas the subsoil has less sand. In a few places the underlying material is silt loam glacial till. In some small areas the depth to the underlying material is less than 24 inches. In a few areas the upper part of the subsoil has more sand and gravel. In many small areas the surface layer is thinner. In some places the soil is only slightly eroded. In other places the solum is thicker. In a few areas the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the moderately well drained Corwin soils on the higher parts of the landscape. Also included are some areas of the poorly drained Chalmers and very poorly drained Wolcott soils in depressions. Included soils make up about 7 to 12 percent of the unit.

The available water capacity in the Odell soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion, runoff, wetness, and crusting are management concerns. The root zone is shallow because excess water hinders root growth. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to fall chiseling and to a till-plant tillage system. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Excess water can be removed by surface drains, subsurface drains, or a combination of these.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Erosion and runoff are hazards, and excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Pn—Peotone silty clay loam, undrained. This nearly level, very poorly drained soil is in depressions and potholes. It is often ponded by runoff from the adjacent slopes. Areas are generally oval or round, but in places they are irregular in shape. They are 3 to 45 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark gray silty clay loam about 12 inches thick. The subsurface layer is black silty clay loam about 15 inches thick. The subsoil is firm silty clay loam about 18 inches thick. The upper part is dark gray, and the lower part is gray and light gray and is mottled. The underlying material to a depth of about 60 inches is grayish brown and light olive brown, mottled silty clay loam. In some areas the slope is more than 2 percent. In some small areas the depth to the underlying material is less than 38 or more than 60 inches. In a few places the dark surface soil is less than 24 inches thick. In many areas it is more than 36 inches thick. In a few areas the lower part of the solum and the underlying material have more clay. In places the underlying material contains marl. In a few places, the solum has less clay and the underlying material has more sand.

Included with this soil in mapping are some small areas of the moderately well drained Montmorenci soils on the higher parts of the landscape. Also included are a few areas of somewhat poorly drained soils at the edge of the depressions and potholes. Included soils make up about 2 to 8 percent of the unit.

The available water capacity in the Peotone soil is high. Permeability is moderately slow. Runoff is ponded or very slow. The water table is near or above the surface from winter to early summer. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas are used for wildlife habitat. Some are used for cultivated crops, but the crops may not mature because of the ponding. This soil is generally unsuited to corn, soybeans, and small grain. The ponding hinders the use of farm equipment. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth.

This soil is generally unsuited to grasses and legumes for hay or pasture. Ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns.

Because of the shrink-swell potential, the moderately slow permeability, and the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of the shrink-swell potential, frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets help to overcome these limitations.

The land capability classification is Vw. No woodland ordination symbol is assigned.

Pt—Pits, gravel. This nearly level to gently sloping, somewhat poorly drained to well drained map unit is in depressions, along side slopes, and on ridgetops in the uplands. Areas are square or rectangular and are 3 to 9 acres in size. The dominant size is about 3 acres.

A typical area of this unit is an excavation about 10 to 40 feet deep. Sand and gravelly sand are exposed in the excavations. Some small areas support shrubs and herbaceous plants. In a few areas the soil material is sandy loam and loam and is not vegetated.

Included in this unit in mapping are some small areas of very poorly drained soils that have a seasonal high water table above or near the surface. These soils are in depressions. Also included are many small areas of soils that are steeper than the pits. These soils are mainly at the edge of the pits. Included soils make up about 10 to 14 percent of the unit.

Most areas are mined for sand and gravel. Some are used as wildlife habitat. This unit is generally unsuited to cultivated crops and is poorly suited to hay, pasture, and woodland. Soil blowing is a hazard. Wetness, droughtiness, low fertility, and the large amount of gravel and cobblestones are management concerns. The unit is not used as a site for dwellings, local roads and streets, or septic tank absorption fields.

No land capability classification or woodland ordination symbol is assigned.

RuA—Rush silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is along drainageways and on broad flats, low rises, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 59 inches thick. The upper part is yellowish brown, friable silty clay loam and clay loam. The next part is strong brown, mottled, friable sandy clay loam. The lower part is strong brown and brown, mottled, very friable gravelly loamy sand and gravelly sandy loam. The underlying material to a depth of about 80 inches is yellowish brown gravelly sand. In some places the subsoil has more sand and less silt. In other places the soil has a slope of more than 2 percent and is moderately eroded. In a few areas it is moderately well drained. In some small areas the depth to the underlying material is less than 45 or more than 70 inches. In a few areas the underlying material is loam glacial till. In a few places the surface layer is thicker. In a few areas the subsoil has less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils on the slightly lower parts of the landscape and small areas of the very poorly drained Comfrey soils on flood plains. Also included, on the slightly lower parts of the landscape, are a few areas of somewhat poorly drained soils having a surface layer that is thinner or lighter colored than that of the Rush soil. Included soils make up about 4 to 8 percent of the unit.

The available water capacity in the Rush soil is high. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is slow. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crusting is a problem. A system of conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to no-till and till-plant cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. Because of low strength and frost action, it is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

The land capability classification is I. The woodland ordination symbol is 5A.

RuB2—Rush silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is along drainageways and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 70 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is about 8 inches of dark brown silt loam mixed with yellowish brown silty clay loam from the subsoil. The subsoil is about 57 inches thick. The upper part is yellowish brown, friable silty clay loam and silt loam. The next part is yellowish brown, mottled, friable loam. The lower part is strong brown and yellowish brown, mottled, friable gravelly sandy clay loam and very friable gravelly loamy sand. The underlying material to a depth of about 80 inches is yellowish brown, mottled gravelly loamy coarse sand. In some places the subsoil has more sand and less silt. In other places the slope is less than 2 or more than 6 percent. In a few areas the soil is moderately well drained. In some small areas the depth to the underlying material is less than 45 or more than 70 inches. In a few areas the underlying material is loam glacial till. In a few places the surface layer is thicker. In some areas the soil is severely eroded. In a few areas the subsoil has less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane soils in the slightly lower landscape positions and small areas of the very poorly drained Comfrey soils on flood plains. Also included, on the slightly lower parts of the landscape, are a few areas of somewhat poorly drained soils having a surface layer that is thinner or lighter colored than that of the Rush soil. Included soils make up about 4 to 8 percent of the unit.

The available water capacity in the Rush soil is high. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is medium. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These practices and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Plant competition is severe. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. Because of frost action and low strength, it is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Sd—Seafield fine sandy loam. This nearly level, somewhat poorly drained soil is on slight rises and ridges in the uplands. Areas are elongated and narrow or are irregular in shape. They are 3 to 20 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 34 inches thick. It is mottled and friable. The upper part is yellowish brown fine sandy loam and sandy clay loam. The lower part is grayish brown and light brownish gray fine sandy loam. The underlying material to a depth of about 60 inches is light gray and pale brown, mottled fine sand. In some areas the slope is more than 2 percent. In other areas the surface layer is lighter colored. In places the subsoil has more clay. In a few places, the upper part of the soil has more sand or the underlying material has more gravel. In some small areas the depth to the underlying material is more than 45 inches. In a few areas the surface layer is thicker. In some places the subsoil has more clay. In other places the underlying material is loam glacial till.

Included with this soil in mapping are small areas of the moderately well drained Ayr Variant, Brems Variant, and Billett soils on the higher parts of the landscape. Also included are a few areas of poorly drained soils in depressions. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Seafield soil is moderate. Permeability is moderately rapid in the solum and very rapid in the underlying material. Runoff is slow. The water table is at a depth of 1 to 2 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for woodland, hay, or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and soil blowing are management concerns. Droughtiness is a problem in the summer. The root zone is shallow because excess water hinders root growth. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage that leaves protective amounts of crop residue on the surface, establishing buffer strips or vegetative barriers, planting cover crops or green manure crops, ridging at an angle to the prevailing wind, or a combination of these. The soil is well suited to a till-plant cropping system. Excess water can be removed by surface drains, subsurface drains, or a combination of these. Fall-seeded crops can make good use of the limited amount of available water.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Soil blowing is a hazard. Excess water and frost heaving are limitations. Also, the soil becomes droughty during the summer. Overgrazing results in soil blowing and reduces plant density and hardiness. Grazing during wet periods causes surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control soil blowing, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is well suited to trees. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the wetness, this soil is severely limited as a site for dwellings. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

This soil is severely limited as a site for local roads and streets because of frost action. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by frost action.

Because of a poor filtering capacity and the wetness, this soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. Filling or mounding with suitable material improves the capacity of the field to filter the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. The woodland ordination symbol is 3A.

Sh—Selma silty clay loam, till substratum. This nearly level, poorly drained soil is along and in narrow drainageways and in broad low areas, depressional areas, and swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or are long and narrow and are 3 to more than 500 acres in size. The dominant size is about 200 acres.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is about 4 inches of very dark gray silty clay loam. The subsoil is about 30 inches thick. It is mottled and friable. The upper part is gray silty clay loam. The lower part is grayish brown clay loam and loam. The upper part of the underlying material is yellowish brown, mottled, stratified sand, loamy sand, loam, and silt loam. The lower part to a depth of about 60 inches is light olive brown, mottled loam. In a few areas the upper part of the underlying material has less sand and more clay. In some places the underlying material is loam or silt loam glacial till or is either stratified loamy material or stratified sandy and loamy material. In other places the slope is more than 2 percent. In a few areas the lower part of the solum and the underlying material have more gravel. In some small areas the depth to the underlying material is less than 35 or more than 55 inches. In some areas the solum has more clay. In other areas the surface soil is more than 24 inches thick. In places the subsoil and underlying material have more gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Darroch, Gilboa, and

Whitaker soils on low rises. These soils make up about 6 to 15 percent of the unit.

The available water capacity in the Selma soil is high. Permeability is moderate in the solum and moderately slow in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring.

Working this soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant tillage systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action and ponding. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Sk—Selma silty clay loam, moderately fine substratum. This nearly level, poorly drained soil is along and in narrow drainageways and in broad low areas, depressional areas, and swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or are long and narrow. They are 3 to more than 500 acres in size. The dominant size is about 80 acres.

Typically, the surface soil is very dark gray silty clay loam about 12 inches thick. The subsoil is about 25 inches thick. It is grayish brown and mottled. The upper part is firm silty clay loam and clay loam. The lower part is friable sandy clay loam. The upper part of the underlying material is yellowish brown, mottled, stratified sand, loamy sand, sandy loam, and silt loam. The lower part to a depth of about 60 inches is yellowish brown, mottled silty clay loam. In a few areas the upper part of the underlying material has less sand and more clay. In some places the solum has less sand. In other places the underlying material is stratified loamy material. In some areas the slope is more than 2 percent. In some small areas the depth to the underlying material is less than 35 or more than 55 inches. In many areas the solum has more clay. In some areas the surface soil is more than 24 inches thick. In many places the subsoil and underlying material have more gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Darroch, Gilboa, and Whitaker soils on low rises. These soils make up about 4 to 10 percent of the unit.

The available water capacity in the Selma soil is high. Permeability is moderate in the solum and moderately slow or slow in the underlying material. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring.

Working this soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant tillage systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action and ponding. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by ponding and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

SxA—Swygert silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is along and in drainageways and on flats, low rises, and ridgetops in the uplands. Areas are irregularly shaped, round, or crescent shaped and are 3 to 200 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark gray silty clay loam about 12 inches thick. The subsoil is mottled silty clay about 32 inches thick. The upper part is brown and friable, the next part is brown and grayish brown and is firm, and the lower part is gray and very firm. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam. In places the slope is more than 2 percent. In some small areas the depth to the underlying material is less than 35 inches. In many small areas the subsoil has less clay and more sand. In some areas the upper part of the underlying material is stratified sandy and loamy material.

Included with this soil in mapping are small areas of the poorly drained Bryce and Selma soils and other poorly drained soils in depressions. The latter soils have less clay and more sand in the subsoil than the Swygert soil and are underlain by silty clay loam or silty clay glacial till. Also included are a few areas of moderately well drained soils that have more sand and less clay in the subsoil than the Swygert soil. These soils are on the higher parts of the landscape. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Swygert soil is moderate. Permeability is slow in the upper part of the solum and very slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 2 to 4 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness and crusting are limitations. The root zone is shallow because excess water hinders root growth. Surface drains, subsurface drains, or a combination of these can remove this water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a ridge-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is severely limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action, low strength, and the shrink-swell potential, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by frost action and by shrinking and swelling and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

Because of the very slow and slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIw. No woodland ordination symbol is assigned.

SxB2—Swygert silty clay loam, 2 to 6 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is along drainageways and on low rises, knolls, long side slopes, and ridgetops in the uplands. Areas are irregularly shaped, oval, round, or crescent shaped. They are 3 to 80 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is about 11 inches of very dark grayish brown silty clay loam mixed with light olive brown, mottled silty clay from the subsoil. The subsoil is mottled silty clay about 23 inches thick. The upper part is light olive brown and is friable and firm, and the lower part is olive and very firm. The underlying material to a depth of about 60 inches is light olive brown, mottled silty clay loam and silty clay. In some areas the slope is less than 2 or more than 6 percent. In many small areas, the depth to the underlying material is less than 35 inches or the subsoil has less clay and more sand. In places the upper part of the underlying material is stratified sandy and loamy material. In many areas the surface layer is lighter colored or thinner.

Included with this soil in mapping are small areas of the poorly drained Bryce soils and other poorly drained soils in depressions. The latter soils have less clay and more sand in the upper part of the subsoil than the Swygert soil and are underlain by silty clay loam or silty clay glacial till. Also included, on the higher rises, are a few small areas of moderately well drained soils that have more sand and less clay in the subsoil than the Swygert soil. Included soils make up about 6 to 12 percent of the unit.

The available water capacity in the Swygert soil is moderate. Permeability is slow in the upper part of the solum and very slow in the lower part and in the underlying material. Runoff is medium. The water table is at a depth of 2 to 4 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion, runoff, and wetness are management concerns. Crusting is a problem. The root zone is shallow because excess water hinders root growth. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a conservation tillage system that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to fall chiseling and to a ridge-plant tillage system. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Excess water can be removed by surface drains, subsurface drains, or a combination of these.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Erosion and runoff are hazards, and excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is severely limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the shrink-swell potential and the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of frost action, low strength, and the shrink-swell potential, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

Because of the slow and very slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

TlA—Tippecanoe silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is along drainageways and on broad flats, low rises, and ridgetops in the uplands. Areas are irregular in shape and are 3 to 160 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is about 3 inches of very dark gray silt loam. The subsoil is about 49 inches thick. The upper part is brown, friable silt loam and yellowish brown, mottled, friable clay loam. The next part is yellowish brown, mottled, friable gravelly sandy clay loam and dark yellowish brown, mottled, very friable gravelly sandy loam. The lower part is dark yellowish brown, mottled, very friable gravelly loamy coarse sand. The underlying material to a depth of about 80 inches is yellowish brown, mottled very gravelly coarse sand. In places the subsoil has less sand and more silt. In a few areas the surface layer is lighter colored or thinner. In some areas the slope is more than 2 percent. In some small areas the depth to the underlying material is more than 70 inches. In a few places, the solum is thinner and the subsoil and underlying material have less gravel. In a few areas the lower part of the solum and the underlying material have more clay. In some areas the lower part of the solum is browner.

Included with this soil in mapping are small areas of somewhat poorly drained soils on the slightly lower parts of the landscape. These soils have a surface layer that is thinner or lighter colored than that of the Tippecanoe soil. Also included are small areas of the very poorly drained Comfrey soils on flood plains. Included soils make up about 4 to 7 percent of the unit.

The available water capacity in the Tippecanoe soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is slow. The water table is at a depth of 3 to 6 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Droughtiness during the summer months and crusting are problems. Fall-seeded crops can make good use of the limited amount of available water. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting and maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content. The soil is well suited to no-till and till-plant cropping systems.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. It is best suited to deep-rooted legumes, such as alfalfa. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is suitable as a site for dwellings without basements. Because of the wetness, it is moderately limited as a site for dwellings with basements and is severely limited as a site for septic tank absorption fields. Installing interceptor drains around the absorption fields and a foundation drainage system on building sites lowers the water table. Constructing the buildings on raised, well compacted fill material increases the depth to the water table.

Because of low strength and frost action, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

The land capability classification is IIs. No woodland ordination symbol is assigned.

TlB—Tippecanoe silt loam, 2 to 4 percent slopes. This gently sloping, moderately well drained soil is along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 40 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is about 3 inches of dark brown silt loam. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, friable clay loam. The next part is brown, mottled, friable gravelly sandy clay loam. The lower part is dark yellowish brown, mottled, very friable gravelly loamy coarse sand. The underlying material to a depth of about 80 inches is pale brown, mottled gravelly coarse sand. In a few places the subsoil has less sand and more silt. In a few areas the surface layer is lighter colored or thinner. In places the slope is less than 2 or more than 4 percent. In some small areas the depth to the underlying material is less than 40 or more than 70 inches. In a few places the subsoil and underlying material have less gravel. In a few areas the lower part of the solum and the underlying material have less sand and more clay. In some areas the lower part of the solum is browner.

Included with this soil in mapping are small areas of somewhat poorly drained soils on the slightly lower parts of the landscape. These soils have a surface layer that is thinner or lighter colored than that of the Tippecanoe soil. Also included are small areas of the very poorly drained Comfrey soils on flood plains. Included soils make up about 5 to 8 percent of the unit.

The available water capacity in the Tippecanoe soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is medium. The water table is at a depth of 3 to 6 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Also, the soil becomes droughty during the summer and crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a conservation tillage system that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Fall-seeded crops can make good use of the limited amount of available water.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting and maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. It is best suited to deep-rooted legumes, such as alfalfa. Erosion and runoff are hazards. Also, the soil becomes droughty during the summer. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is suitable as a site for dwellings without basements. Because of the wetness, it is moderately limited as a site for dwellings with basements and is severely limited as a site for septic tank absorption fields. Installing interceptor drains around the absorption fields and a foundation drainage system on building sites lowers the water table. Constructing the buildings on raised, well compacted fill material increases the depth to the water table.

Because of low strength and frost action, this soil is moderately limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts improve the traffic-supporting capacity. Conveying runoff to suitable outlets minimizes the damage caused by frost action.

The land capability classification is IIe. No woodland ordination symbol is assigned.

VaB2—Varna silt loam, 1 to 5 percent slopes, eroded. This nearly level and gently sloping, moderately well drained soil is along drainageways, in broad areas, and on rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregular in shape and are 3 to 150 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with brown silty clay loam from the subsoil. The subsoil is about 22 inches thick. The upper part is brown, friable silty clay loam. The next part is yellowish brown, firm silty clay. The lower part is yellowish brown, mottled, firm silty clay and silty clay loam. The underlying material to a depth of about 60 inches is light yellowish brown, mottled silty clay loam. In some areas the slope is less than 1 or more than 5 percent. In some small areas the depth to the underlying material is less than 24 inches. In many places the surface layer is lighter colored or thinner. In some areas the upper part of the underlying material is stratified sandy and loamy material. In a few areas the upper part of the subsoil has less clay and more sand and gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Elliott soils on the lower parts of the landscape. These soils make up about 6 to 12 percent of the unit.

The available water capacity in the Varna soil is high. Permeability is moderately slow or slow. Runoff is medium. The water table is at a depth of 3 to 6 feet in late winter and in spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a conservation tillage system that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These practices and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. Erosion and runoff are hazards. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

This soil is moderately limited as a site for dwellings without basements because of the shrink-swell potential and as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. A foundation drainage system lowers the water table. Also, building on raised, well compacted fill material increases the depth to the water table.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by low strength and frost action and improve the traffic-supporting capacity. Conveying runoff to suitable outlets also minimizes the damage caused by frost action.

Because of the moderately slow or slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent. Installing interceptor drains around the absorption field lowers the water table.

The land capability classification is IIe. No woodland ordination symbol is assigned.

Wa—Wallkill Variant silty clay loam. This nearly level, very poorly drained soil is along and in narrow drainageways, on low flats, in depressional areas, and in swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The subsurface layer is about 22 inches thick. It is very dark gray silty clay loam in the upper part and black, mottled silty clay in the lower part. The underlying material to a depth of about 60 inches is black and dark brown muck. In places the slope is more than 2 percent. In some small areas the depth to the underlying material is less than 16 or more than 40 inches. In a few areas the surface layer has less clay. In some areas the soil formed entirely in organic material. In some small areas the lower part of the underlying material is sandy or loamy material, marl, or a combination of these.

Included with this soil in mapping are small areas of the somewhat poorly drained Gilboa and very poorly drained Warners Variant soils. These soils are on low rises and around the edge of the mapped areas. Also included are a few areas of somewhat poorly drained soils. These soils are around the edge of the mapped areas. Included soils make up about 4 to 8 percent of the unit.

The available water capacity in the Wallkill Variant soil is very high. Permeability is slow or moderately slow in the mineral layers and moderately slow to moderately rapid in the organic layers. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas are used for cultivated crops. This soil is fairly well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring. A drainage system also improves the stability of the muck.

Working this soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, and soil aeration and help to prevent crusting after periods of heavy rainfall. The soil should be plowed only in the spring.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay and pasture. Ponding and burning are hazards. Frost heaving is a limitation. Other management concerns are overgrazing and grazing when the soil is wet. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of low strength and ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Removing the unstable organic material, constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by excess water, low strength, and frost action and improve the traffic-supporting capacity. Pilings are necessary in some areas. Conveying runoff to suitable outlets minimizes the damage caused by excess water and frost action.

The land capability classification is IIIw. No woodland ordination symbol is assigned.

Wb—Warners Variant silty clay, undrained. This nearly level, very poorly drained soil is on low flats and in depressional areas on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregular in shape and are 3 to 65 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is black silty clay about 12 inches thick. The subsoil is about 11 inches of dark gray, mottled, firm silty clay. The upper part of the underlying material is gray, mottled marl. The next part is olive gray, mottled silt loam and gravelly fine sandy loam. The lower part to a depth of about 60 inches is gray, mottled loam. In some areas the underlying material does not have a layer of marl and contains more clay. In other areas the solum contains less clay. In a few places the surface layer is thicker. In a few areas the underlying material has less sand and gravel. In some areas the marl extends below a depth of 60 inches.

Included with this soil in mapping are a few scattered areas of the very poorly drained Wallkill Variant soils. Also included are a few areas of somewhat poorly drained soils around the edges of the unit. Included soils make up about 3 to 8 percent of the unit.

The available water capacity in the Warners Variant soil is high. Permeability is moderately slow or slow in the upper part of the profile, moderately rapid or rapid in the middle part of the underlying material, and moderately slow in the lower part. Runoff is ponded or very slow. The water table is near or above the surface from winter to midsummer. The organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas are used as wildlife habitat. Some attempts are being made to grow cultivated crops, but the crop may not mature because of the ponding (fig. 9). This soil is generally unsuited to corn, soybeans, and small grain because of the ponding, cold soil temperatures, puddling, and crusting. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment.

This soil is generally unsuited to grasses and legumes for hay or pasture. The ponding is a hazard, and frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns.

Because of low strength and ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action and ponding. Constructing the roads on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by excess water and frost action.

The land capability classification is Vw. No woodland ordination symbol is assigned.

WhA—Wea silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is along drainageways and on broad flats, low rises, and ridgetops in the uplands. Areas are generally irregular in shape and are 3 to 180 acres in size. The dominant size is about 25 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is

Figure 9.—Ponding in a cultivated area of Warners Variant silty clay, undrained.

very dark grayish brown silty clay loam about 7 inches thick. The subsoil is about 43 inches thick. It is friable. The upper part is dark yellowish brown clay loam. The next part is dark yellowish brown and brown gravelly sandy clay loam and gravelly sandy loam. The lower part is dark yellowish brown, mottled gravelly sandy clay loam. The underlying material to a depth of about 80 inches is yellowish brown, mottled gravelly loamy coarse sand. In places the subsoil has less sand and more silt. In a few areas the surface layer is lighter colored or thinner. In places the slope is more than 2 percent. In some small areas the depth to the underlying material is more than 70 inches. In a few areas the lower part of the solum and the underlying material have more clay and less sand. In some places the lower part of the solum is grayer. In other places loam glacial till underlies the gravelly loamy coarse sand. In a few places the subsoil has less clay. In a few areas the underlying material has less gravel. In places it is redder.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane and very poorly drained Comfrey and Free soils. Crane soils are in the slightly lower areas. Comfrey soils are on flood plains. Free soils are in depressional areas. Also included are small areas of somewhat poorly drained soils having a surface layer that is thinner or lighter colored than that of the Wea soil. These soils are in the slightly lower positions on the landscape. Included soils make up about 4 to 7 percent of the unit.

The available water capacity in the Wea soil is moderate. Permeability is moderate in the upper part of the profile and very rapid in the underlying material. Runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. It becomes droughty during the summer. Crusting is a problem. Fall-seeded crops can make good use of the limited amount of available water in the soil. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a system of conservation tillage that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. The soil is well suited to no-till and till-plant cropping systems. Conservation tillage, cover crops, green manure crops, and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. It is best suited to deep-rooted legumes and drought-tolerant forage species. It becomes droughty during the summer. Overgrazing and grazing during wet periods are the main management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarse textured material, excavating the soil and replacing it with better suited material, and using expansion joints help to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts improve the traffic-supporting capacity.

The land capability classification is IIs. No woodland ordination symbol is assigned.

WhB2—Wea silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is along drainageways and on broad flats, rises, long side slopes, ridgetops, and knolls in the uplands. Areas are irregularly shaped or are long and narrow. They are 3 to 80 acres in size. The dominant size is about 25 acres.

Typically, the surface layer is about 10 inches of very dark grayish brown silt loam mixed with dark yellowish brown clay loam from the subsoil. The subsoil is about 40 inches thick. It is friable. The upper part is dark yellowish brown clay loam. The next part is brown gravelly sandy clay loam. The lower part is brown gravelly sandy loam. The underlying material to a depth of about 60 inches is pale brown, mottled gravelly coarse sand. In some areas the slope is less than 2 or more than 6 percent. In some small areas the depth to the underlying material is less than 40 or more than 70 inches. In a few places the surface layer is lighter colored. In some areas the upper part of the solum has less sand. In a few areas the lower part of the solum and the underlying material have more clay and less sand. In some areas the lower part of the solum is grayer. In other areas the underlying material is loam glacial till. In a few areas the subsoil has less clay. In some places the soil is severely eroded. In other places the underlying material is redder.

Included with this soil in mapping are small areas of the somewhat poorly drained Crane and very poorly drained Comfrey and Free soils. Crane soils are in the slightly lower areas. Comfrey soils are on flood plains. Free soils are in depressions. Also included are small areas of somewhat poorly drained soils having a surface layer that is thinner or lighter colored than that of the Wea soil. These soils are in the slightly lower positions on the landscape. Included soils make up about 5 to 8 percent of the unit.

The available water capacity in the Wea soil is moderate. Permeability is moderate in the solum and very rapid in the underlying material. Runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are hazards. Also, the soil becomes droughty during the summer and crusting is a problem. Erosion can be controlled by water- and sediment-control basins, diversions, terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, green manure crops, grade stabilization structures, or a combination of these. The soil is well suited to no-till and till-plant cropping systems. Grassed waterways help to control erosion in the drainageways. A cropping system that includes close-growing crops also helps to control erosion. Fall-seeded crops can make good use of the limited amount of available water.

Working this soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. Cover crops, green manure crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent crusting after periods of heavy rainfall. These practices and applications of animal waste help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, the moisture supply, and the organic matter content.

This soil is well suited to grasses and legumes, such as orchardgrass and alfalfa, for hay or pasture. It is best suited to deep-rooted legumes and drought-tolerant forage species. Erosion and runoff are hazards. Also, the soil becomes droughty during the summer. Overgrazing results in erosion and reduces plant density and hardiness. Grazing during wet periods results in surface compaction, poor tilth, and excessive runoff, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer help to control erosion, minimize surface compaction, maintain good plant density and hardiness, and keep the pasture in good condition.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength. Constructing the roads and streets on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts improve the traffic-supporting capacity.

The land capability classification is IIe. No woodland ordination symbol is assigned.

WoA—Whitaker silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is along narrow drainageways and on low flats and low rises in the uplands. Areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 33 inches thick. It is mottled and friable. The upper part is brown silty clay loam and clay loam. The next part is brownish yellow loam. The lower part is light olive brown loam that has thin strata of sandy loam, fine sandy loam, very fine sandy loam, and silt loam. The underlying material to a depth of about 60 inches is light olive brown, mottled loam and fine sandy loam that has strata of loamy sand, silt loam, sand, and coarse sand. In a few areas the subsoil has less sand and more silt. In some areas the slope is more than 3 percent. In other areas the underlying material has more clay. In places the solum has less clay. In some small areas the depth to the underlying material is less than 40 or more than 60 inches. In a few places the surface layer is darker and thicker. In some areas the underlying material is loam glacial till.

Included with this soil in mapping are small areas of moderately well drained soils and soils that have loam glacial till in the lower part of the underlying material. Both of these included soils are on slight rises. Also included are some areas of the poorly drained Selma soils in depressions. Included soils make up about 4 to 8 percent of the unit.

The available water capacity in the Whitaker soil is high. Permeability is moderate in the upper part of the profile and moderate or moderately rapid in the underlying material. Runoff is slow. The water table is at a depth of 1 to 3 feet during winter and spring. The organic matter content is low in the surface layer. This layer is friable and can be easily tilled under proper moisture conditions.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is a limitation. Crusting is a problem. The root zone is shallow because excess water hinders root growth. This water can be removed by surface drains, subsurface drains, or a combination of these. Working the soil at the correct moisture content minimizes compaction and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops improve or help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall chiseling and to a till-plant tillage system.

This soil is well suited to some grasses and legumes, such as orchardgrass and birdsfoot trefoil, for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. Excess water and frost heaving are limitations. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings grow well if competing vegetation is controlled by plow planting, proper site preparation, spraying, cutting, furrowing, girdling, or special harvest methods. Other management practices are excluding livestock, harvesting mature trees, and saving desirable seed trees.

Because of the wetness, this soil is severely limited as a site for dwellings and septic tank absorption fields. Installing interceptor drains around the absorption fields and a foundation drainage system on building sites lowers the water table. Constructing the buildings on raised, well compacted fill material increases the depth to the water table. Because of frost action, the soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material, providing adequate side ditches and culverts, and conveying runoff to suitable outlets minimize the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 4A.

Wt—Wolcott loam. This nearly level, very poorly drained soil is along and in narrow drainageways, on broad low flats, and in depressional areas and swales on uplands. It is often ponded by runoff from the adjacent slopes. Areas are irregularly shaped or are long and narrow. They are 3 to more than 500 acres in size. The dominant size is about 100 acres.

Typically, the surface layer is very dark gray loam about 9 inches thick. The subsurface layer is about 5 inches of very dark grayish brown, mottled clay loam. The subsoil is mottled, friable loam about 35 inches thick. The upper part is dark gray and dark grayish brown, and the lower part is grayish brown and light gray. The underlying material to a depth of about 60 inches is light gray and light olive brown, mottled loam. In other places the solum has less sand and more silt. In a few places the slope is more than 2 percent. In a few places the upper part of the underlying material has more sand and less clay. In some small areas the depth to the underlying material is less than 30 or more than 60 inches. In a few areas the solum has more clay. In some areas the surface soil is more than 24 inches thick. In other areas the upper part of the underlying material is stratified sandy and loamy material. In a few places the upper part of the subsoil has more sand and gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Odell soils on low rises. Also included are small areas of the moderately well drained Corwin soils on the higher parts of the landscape. Included soils make up about 5 to 10 percent of the unit.

The available water capacity in the Wolcott soil is high. Permeability is moderate. Runoff is ponded or very slow. The water table is near or above the surface during winter and spring. The organic matter content is moderate or high in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. They hinder seedbed preparation.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Cold soil temperatures, puddling, and crusting are problems. The root zone is shallow because excess water hinders root growth. The ponding hinders the use of farm equipment. If a drainage outlet is available, excess water can be removed by surface drains, subsurface drains, pumps, or a combination of these. Small, enclosed depressions can be drained by a combination of an open inlet pipe and a subsurface drainage system. If drained, the soil warms up earlier in the spring.

Working this soil at the correct moisture content helps to control puddling, minimizes compaction, and helps to maintain good soil structure. A system of conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops help to maintain soil structure, tilth, the rate of water infiltration, soil aeration, and the organic matter content and help to prevent crusting after periods of heavy rainfall. The soil is well suited to fall plowing, fall chiseling, and till-plant and ridge-plant cropping systems.

This soil is well suited to some grasses and legumes, such as reed canarygrass and birdsfoot trefoil, for hay or pasture. It is best suited to water-tolerant species. It is not so well suited to deep-rooted legumes, such as alfalfa, as to shallow-rooted forage species. The ponding is a hazard. Frost heaving is a limitation. Overgrazing and grazing during wet periods are the major management concerns. Overgrazing reduces plant density and hardiness. Grazing during wet periods results in surface compaction and poor tilth, damages the sod, and reduces plant density and hardiness and forage yields. Proper stocking rates, timely deferment of grazing, restricted use during wet periods, and accelerated rotation grazing during the summer minimize surface compaction, help to maintain good plant density and hardiness, and help to keep the pasture in good condition.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of frost action, low strength, and ponding. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by excess water and frost action and improve the traffic-supporting capacity.

The land capability classification is IIw. No woodland ordination symbol is assigned.

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 (fig. 10). It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber 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 inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 253,550 acres in the county, or more than 97 percent of the total acreage, meets the soil requirements for prime farmland. Approximately 240,000 acres of this prime farmland is used for cultivated crops, mainly corn and soybeans.

Figure 10.—An area of prime farmland made up of Chalmers and Lisbon soils, which are well suited to cultivated crops. Chalmers soils are in the dark areas.

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 the survey area 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.

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

Michael L. Broadstreet, 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 estimated yields of the main crops and hay and pasture plants are listed for each soil; and the system of land capability classification used by the Soil Conservation Service is explained.

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

About 246,000 acres in the county was used for crops and pasture in 1985. Of this total, about 219,000 acres was used for row crops, mainly corn and soybeans; 6,500 acres for permanent pasture; 4,400 acres for close-grown crops, mainly wheat and oats; 2,700 acres for rotation hay and pasture; and 3,000 acres for specialty crops, such as popcorn, kidney beans, and asparagus, or for conservation purposes. About 10,400 acres was idle land.

The potential of the soils in Benton County for increased food production is fair. Applying the latest crop production technology to all of the cropland in the county would increase production. This soil survey can greatly facilitate the application of such technology.

The paragraphs that follow describe the major concerns in managing the soils in the county for crops and pasture. These concerns are wetness, soil blowing, water erosion, fertility, and tilth.

Wetness is the major problem on about 72 percent of the cropland and pasture in Benton County. Most of the very poorly drained and poorly drained soils, such as Wolcott, Free, Drummer, and Selma soils, are adequately drained. A few areas of Houghton and Peotone soils, however, cannot be economically drained. These are depressional areas where drainage ditches would have to be deep and would have to extend for a great distance to a suitable outlet. Unless drained, the somewhat poorly drained Gilboa, Odell, and Whitaker soils are so wet that crops are damaged in most years.

The design of both surface and subsurface systems varies with the kind of soil. A combination of surface and subsurface drains is needed in most areas of the very poorly drained, poorly drained, and somewhat poorly drained soils that are intensively row cropped. The drains should be more closely spaced in moderately slowly permeable or slowly permeable soils than in the more rapidly permeable soils. Subsurface drainage is slow in Bryce and Swygert soils. Locating adequate drainage outlets is difficult in some areas of Houghton, Peotone, Wallkill Variant, and Warners Variant soils.

Organic soils, such as Houghton, oxidize and subside when their pore space is filled with air. Therefore, special drainage systems are needed to control the depth and period of drainage. Keeping the water table at the level required by the crops during the growing season and raising it to the surface during the rest of the year minimize the oxidation and subsidence of organic soils.

Information about the design of drainage systems for each kind of soil is given in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil blowing is a major problem on about 1 percent of the cropland and pasture in Benton County. It is a hazard on mineral soils that have a coarse or moderately coarse textured surface layer, such as Ayr Variant, Brems Variant, and Seafield soils (fig. 11). The hazard is especially severe if the surface is bare. Soil blowing also is a hazard in bare areas of the finer textured mineral soils. Soils that are plowed in the fall are susceptible to soil blowing in the spring.

Soil blowing can result in the loss of many tons of topsoil per acre per year and can damage emerging crops. Control of soil blowing minimizes this loss. It also minimizes the accumulation of soil material in ditches, on roadways, in fence rows, and behind windbreaks and the pollution of streams by sediment. Soil blowing can be controlled by establishing windbreaks, applying a system of conservation tillage that leaves a protective amount of crop residue on the surface, establishing buffer strips or vegetative barriers, stripcropping, planting cover crops or green manure crops, applying tillage methods that leave the surface rough, ridging at an angle to the prevailing wind, or establishing a permanent cover of vegetation.

Water erosion is a major problem on about 31 percent of the cropland and pasture in the county. It is a hazard if the slope is more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the original surface layer is lost and part of the subsoil is mixed with the plow layer. In spots on some sloping fields, preparing a good seedbed and tilling are difficult because the original friable surface soil has been eroded

Figure 11.—Soil blowing in an area of Ayr Variant soils where the surface is unprotected.

away. These spots are common in areas of Miami and Montmorenci soils. Most fertilizers are highly water soluble. The fertilizer that remains in the plow layer is attached to the soil particles and is carried away on the particles when erosion occurs. Second, erosion can result in sedimentation of streams. Control of erosion prevents the clogging of drainage ditches and pollution of streams by sediment and pesticides and improves water quality for municipal use, for recreation, and for fish and wildlife.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A resource management system that keeps a vegetative cover or crop residue on the surface for extended periods can hold soil losses to an amount that does not reduce the productive capacity of the soils. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence reduces the susceptibility of the more sloping areas to erosion, can increase the supply of nitrogen, and can improve tilth.

Many sloping areas in Benton County can be easily farmed on the contour and terraced. A cropping system that provides a substantial vegetative cover is needed in these areas. Contour farming and terraces are effective on most of the sloping soils in the county, but they are less successful on eroded soils and on soils that have a clayey surface layer. No-till farming can be used in all cultivated areas, and soybeans are being double-cropped in areas of wheat stubble on an increasing acreage. Both of these are effective methods of controlling erosion on sloping land and can be adapted to many soils in the county.

Diversions and parallel tile-outlet terraces shorten the length of slopes and thus are effective in reducing the susceptibility to sheet, rill, and gully erosion. These measures are most practical on deep, well drained and moderately well drained soils, such as Corwin, Foresman, Miami, Montmorenci, and Barce soils. Terraces reduce soil loss and the associated loss of fertilizer elements, help to prevent the damage to crops and watercourses caused by eroding sediment, and help to eliminate the need for grassed waterways, which take productive land out of row crop production. Terracing also makes farming on the contour easier and thus reduces the consumption of fuel and the amount of pesticides entering watercourses.

Many grade stabilization structures are needed in the county because of the number of open ditches. These structures help to control erosion where runoff drains into an open ditch. Also, they are commonly needed in open ditches where an excessive gradient results in erosion on the sides and bottom of some channels. Open ditches in areas of soils that formed in outwash material, such as Crane and Darroch soils, commonly are not stable. The banks are subject to sloughing, and the ditches tend to fill up within a few years. As a result, the capacity of the ditches to remove excess water is reduced. Subsurface drains that extend into the ditches also become clogged. Ditchbank erosion can be controlled by establishing and maintaining sod on the banks. Seedling recommendations can be obtained from local offices of the Soil Conservation Service.

Fertility is naturally high in most of the soils in the county. The soils on uplands, terraces, and outwash plains, such as Corwin, Wea, and Barce soils, are generally neutral to strongly acid. Most of the coarser textured upland soils, such as Ayr Variant, Brems Variant, and Seafield soils, also are naturally neutral to strongly acid.

Comfrey and other soils on flood plains are neutral or mildly alkaline and are naturally higher in content of plant nutrients than most upland soils. The very poorly drained and poorly drained soils, such as Wolcott and Selma soils, are in depressional areas and on broad flats. They generally are neutral to medium acid and are high in content of plant nutrients. The mucky Houghton soils are mildly alkaline to medium acid and are high in content of most plant nutrients.

Additions of lime or fertilizer are needed on most of the soils. On all soils additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied.

Tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. Many of the soils used for crops in the county have a surface layer of silt loam that is high in content of organic matter. Generally, the structure of these soils is moderate or weak. A surface crust forms during periods of heavy rainfall. The crust is hard when dry and impervious to water. As a result, it reduces the rate of water infiltration and increases the runoff rate. Returning crop residue to the soil and regularly adding manure and other organic material improve soil structure and minimize crusting.

Fall plowing generally should not be used as a means of improving the tilth of sloping soils that have a silt loam surface layer because a crust forms during winter and spring. Also, these soils are subject to erosion if they are plowed in the fall. In many areas they are nearly as dense and hard at planting time as they were before they were plowed in the fall.

The poorly drained and very poorly drained Ashkum, Bryce, Comfrey, and Drummer soils have a surface layer that is high in content of clay. Tilth is a problem because these soils often stay wet until late in spring. If plowed when wet, the soils tend to be very cloddy when dry. Because of the cloddiness, preparing a good seedbed is difficult. Fall plowing or chiseling generally results in good tilth in the spring.

Field crops suited to the soils and climate of the county include some that are rarely grown. Corn, soybeans, and wheat are the main crops. Oats and rye are grown to a limited extent. Hay or seed could be produced from brome, fescue, redtop, and bluegrass.

Grasses and legumes for *hay or pasture* are grown to a minor extent on most of the soils in the county. A permanent cover of grasses and legumes slows runoff and helps to control water erosion and soil blowing.

Many of the coarser textured soils in the county are well suited to hay and pasture. Examples are Ayr Variant and Brems Variant soils. Water erosion, runoff, and soil blowing are the main hazards on these soils. Insufficient moisture during the summer months can result in droughtiness. These soils are better suited to deep-rooted legumes and drought-tolerant grasses than to other species. The best suited grass species are smooth bromegrass, red fescue, tall fescue, sudangrass, and switchgrass. The least well suited species are Kentucky bluegrass, bromegrass, ryegrass, and timothy. These species generally cannot tolerate the doughtiness. The best suited legumes are sweet clover, alfalfa, crownvetch, and lespedeza. The least well suited legumes are crimson clover, ladino clover, red clover, and white clover. Irrigation minimizes droughtiness, helps to control soil blowing, and can result in a high forage yield (*7*).

Two alternatives to permanent pasture on the coarser textured soils are a continuous small grain rotation or a small grain rotation that includes grasses and legumes. These alternatives provide a cash income and help to control soil blowing.

Somewhat poorly drained to very poorly drained soils, such as Selma and Wolcott soils, are limited by wetness. They are best suited to water-tolerant grasses and legumes, which can withstand a high water table between late fall and early spring. The best suited grass species are reed canarygrass and redtop. The least well suited grasses are Kentucky bluegrass, bromegrass, smooth bromegrass, red fescue, orchardgrass, ryegrass, sudangrass, switchgrass, and timothy. No legumes grow well on these wet soils, but the best suited ones are ladino clover, white clover, and birdsfoot trefoil. The least well suited legumes are alfalfa, crimson clover, and sweet clover. Subsurface drains reduce the wetness of these soils (*7*).

Erosion and runoff are problems on moderately well drained and well drained soils, such as Corwin, Foresman, and Montmorenci soils. These soils are suited to most grasses and legumes. Generally, Kentucky bluegrass, bromegrass, smooth bromegrass, tall fescue, orchardgrass, and timothy are the best grass species for seeding mixtures. Alfalfa, red clover, ladino clover, alsike clover, and birdsfoot trefoil are the best legume species for these mixtures (*7*).

Organic soils are highly susceptible to soil blowing, especially during the summer, when the surface layer generally becomes very dry. Irrigation, good plant density, and proper stocking rates help to control soil blowing on these soils.

The seeding mixtures generally recommended for permanent pasture are birdsfoot trefoil and timothy; timothy, red clover, and ladino clover; reed canarygrass, ladino clover, and alsike clover; and tall fescue. The seeding mixtures generally recommended for hay, hay silage, or rotation grazing are alfalfa and timothy; alfalfa, red clover, and orchardgrass; red clover and orchardgrass; alfalfa, bromegrass, and ladino clover; and tall fescue, white clover, red clover, and lespedeza (*7*).

Overgrazing and grazing when the soil is too wet are concerns in managing pasture. Overgrazing reduces plant density and plant hardiness. It also causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, restricted use during wet periods, and timely applications of nutrients help to keep the pasture in good condition.

Specialty crops, including kidney beans, sweet corn, sorghum, and asparagus, are of commercial importance in Benton County. Most of the well drained and moderately well drained soils in the county are suitable for orchards and nursery crops. Soils in low areas where frost is frequent and air drainage is poor generally are poorly suited to orchards. The latest information about growing specialty crops can be obtained from local offices of the Soil Conservation Service.

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. 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. 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 rangeland, 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 limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. 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

Michael D. Warner, forester, Soil Conservation Service, helped prepare this section.

Virgin forest species formerly grew in scattered groves along the streams and drainageways in Benton County, but the trees have been cleared from most of the land suitable for cultivation. The remaining woodland commonly occurs as soils that are too steep or too wet for farming. It makes up about 2,000 acres, or less than 1 percent of the total acreage in the county. It is mainly in scattered areas in the southern half of the county. The largest wooded areas are in soil associations 6, 7, and 8, which are described under the heading "General Soil Map Units." The most common trees in the uplands are bur oak, white oak, sugar maple, red maple, yellow-poplar, hickory, elm, and black cherry. The main species on bottom land and in wet areas on uplands are pin oak, cottonwood, ash, sycamore, and silver maple.

Thinning out mature trees and undesirable species can improve much of the existing commercial woodland. Measures that protect the woodland from grazing and fire and control diseases and insects also can improve the stands. The Soil Conservation Service, the Indiana Department of Natural Resources, and the Cooperative Extension Service can help to determine specific management needs.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *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 8, *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 are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the 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 for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on 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 (fig. 12). 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

Figure 12.—A windbreak in an area of Corwin soils.

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 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, 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 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

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 or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

James D. McCall, wildlife biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, soybeans, and sorghum.

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 orchardgrass, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, ragweed, foxtail, crabgrass, dandelion, and dock.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, yellow-poplar, cherry, sweetgum, maple, elm, sycamore, hawthorn, dogwood, hickory, blackberry, and ash. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are serviceberry, hazelnut, elderberry, Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, 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. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, red fox, redwing blackbird, and woodchuck.

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 chipmunks, owls, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of marshy or swampy shallow water areas (fig. 13). Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, and mink.

Edge habitat consists of areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

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

Figure 13.—An area of the very poorly drained Comfrey soils, which provide good habitat for wetland wildlife.

not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 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 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading.

Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 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 aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

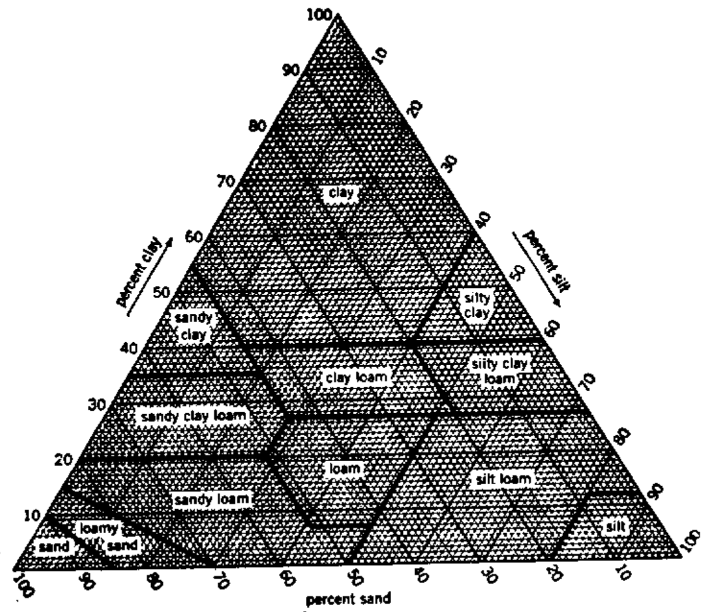

Figure 14.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 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 (fig. 14). "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.

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 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and 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 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, 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. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 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 it 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; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered 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 18 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 18.

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 is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). 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. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that 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. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*8*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*9*). 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."

Andres Series

The Andres series consists of somewhat poorly drained soils on end moraines and ground moraines. These soils formed in outwash and the underlying glacial till. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 4 percent.

Andres soils are similar to Elliott, Gilboa, and Swygert soils and are adjacent to Ashkum soils. Elliott and Swygert soils have more clay in the solum than the Andres soils. Gilboa soils have less clay in the lower part of the solum and in underlying material than the Andres soils. Ashkum soils are grayer in the solum than the Andres soils. They are poorly drained and are in depressional areas.

Typical pedon of Andres silt loam, 0 to 2 percent slopes, in a cultivated field; 1,400 feet west and 75 feet south of the northeast corner of sec. 3, T. 26 N., R. 7 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark brown (10YR 2/2) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; many very fine roots; slightly acid; abrupt wavy boundary.

Bt1—12 to 23 inches; brown (10YR 4/3) clay loam; common fine distinct yellowish brown (10YR 5/4) and many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; common very dark brown (10YR 2/2) krotovinas; slightly acid; clear wavy boundary.

Bt2—23 to 35 inches; brown (10YR 5/3) clay loam; many medium faint grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces on peds; about 4 percent gravel; common very dark brown (10YR 2/2) krotovinas; neutral; abrupt irregular boundary.

2Bt3—35 to 40 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct olive yellow (2.5Y 6/6), many fine faint grayish brown (2.5Y 5/2), and many fine distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent gravel; common very dark brown (10YR 2/2) krotovinas; slight effervescence; moderately alkaline; clear wavy boundary.

2C1—40 to 52 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (2.5Y 5/2) mottles; massive; firm; about 1 percent gravel; common white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—52 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct light brownish gray (2.5Y 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; about 1 percent gravel; common white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has value of 4 or 5 and chroma of 2 to 4. It is medium acid to neutral. It is silty clay loam, clay loam, sandy clay loam, gravelly clay loam, or gravelly sandy clay loam. The content of gravel in this horizon ranges from 0 to 20 percent. The 2Bt and 2C horizons are silt loam or silty clay loam. They are mildly alkaline or moderately alkaline. The 2Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6.

Ashkum Series

The Ashkum series consists of poorly drained, moderately slowly permeable soils on end moraines and ground moraines. These soils formed in silty deposits and the underlying glacial till. Slopes range from 0 to 2 percent.

Ashkum soils are similar to Bryce, Chalmers, Peotone, and Wolcott soils and are adjacent to Andres, Elliott, and Markham soils. Bryce soils have more clay in the lower part of the solum and in the underlying material than the Ashkum soils. Andres, Chalmers, and Wolcott soils have less clay in the solum than the Ashkum soils. The dark surface layer in Peotone soils is thicker than that in the Ashkum soils. Andres, Elliott, and Markham soils are browner in the solum than the Ashkum soils. Andres and Elliott soils are on the slightly higher knolls and rises. Markham soils are in the higher areas.

Typical pedon of Ashkum silty clay loam, in a cultivated field; 1,600 feet east and 175 feet south of the northwest corner of sec. 4, T. 26 N., R. 7 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; few very fine roots; neutral; abrupt smooth boundary.

A—8 to 14 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; friable; few very fine roots; neutral; clear wavy boundary.

BA—14 to 18 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; many fine distinct yellowish brown (10YR 5/4) mottles; moderate fine angular blocky structure; friable; few very fine roots; neutral; clear wavy boundary.

Btg1—18 to 24 inches; dark gray (10YR 4/1) silty clay; many fine distinct yellowish brown (10YR 5/4) mottles; weak fine prismatic structure parting to moderate fine angular blocky; friable; thin continuous dark gray (10YR 4/1) clay films on faces of peds; about 1 percent gravel; few very fine roots; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

Btg2—24 to 30 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6), common medium faint dark gray (10YR 4/1), and common medium distinct light brownish gray (10YR 6/2) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; thin continuous gray (10YR 5/1) clay films on faces of peds; about 2 percent gravel; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

2Btg3—30 to 37 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) and many medium faint gray (10YR 5/1) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds; about 7 percent gravel; common very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; clear wavy boundary.

2Btg4—37 to 42 inches; grayish brown (10YR 5/2) silty clay loam; many medium faint gray (10YR 5/1) and many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; thin patchy gray (10YR 5/1) clay films on faces of peds; about 7 percent gravel; common very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; gradual wavy boundary.

2C—42 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/8) mottles; massive; very firm; about 7 percent gravel; slight effervescence; moderately alkaline.

The solum is 35 to 60 inches thick. The silty deposits are 20 to 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. The Btg and 2Btg horizons have hue of 10YR, 2.5Y, or 5Y, value of 3 to 6, and chroma of 1 or 2, or they are neutral in hue and have value of 3 to 6. Value of 3 is limited to the upper few inches of the Btg horizon. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 4. It is mildly alkaline or moderately alkaline.

Ayr Variant

The Ayr Variant consists of moderately well drained soils on end moraines and ground moraines. These soils formed in outwash deposits and the underlying glacial till. Permeability is rapid in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 2 to 6 percent.

Ayr Variant soils are adjacent to Billett, Brems Variant, and Seafield soils. Billett and Brems Variant soils are in landscape positions similar to those of the Ayr Variant soils. They have less clay in the lower part of the solum than the Ayr Variant soils. Also, Brems Variant soils have a lighter colored surface layer. Seafield soils are grayer in the solum than the Ayr Variant soils. They are in the lower areas.

Typical pedon of Ayr Variant fine sandy loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,980 feet east and 1,240 feet south of the northwest corner of sec. 20, T. 25 N., R. 8 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; mixed with yellowish brown (10YR 5/8) material from the subsoil; weak fine granular structure; very friable; few fine and medium roots; strongly acid; abrupt smooth boundary.

BA—10 to 22 inches; yellowish brown (10YR 5/8) loamy sand; weak fine subangular blocky structure parting to weak fine granular; very friable; few fine roots; many dark brown (10YR 3/3) krotovinas and organic stains along root channels; medium acid; clear wavy boundary.

Bt1—22 to 33 inches; dark brown (7.5YR 4/4) fine sandy loam; few fine distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 3/4) clay films on faces of peds; about 3 percent gravel; few yellowish red (5YR 5/8) accumulations of iron; few dark brown (7.5YR 3/2) stains on faces of peds; medium acid; gradual irregular boundary.

2Bt2—33 to 46 inches; yellowish brown (10YR 5/4) loam; few fine distinct light gray (10YR 7/1) and common medium distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds and as linings of voids; common yellowish red (5YR 5/8) accumulations of iron; few dark brown (7.5YR 3/2) stains on faces of peds; many black (10YR 2/1) shale fragments; neutral; clear wavy boundary.

2Bt3—46 to 55 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; friable; thin patchy grayish brown (10YR 5/2) clay films on faces of peds and as linings of voids; common yellowish red (5YR 5/8) accumulations of iron; many black (10YR 2/1) shale fragments; mildly alkaline; clear irregular boundary.

2C—55 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; about 5 percent gravel; slight effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The outwash deposits range from 20 to 50 inches in thickness.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The BA and Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. They are strongly acid to slightly acid. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The C horizon has hue of 10YR or 2.5Y and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Barce Series

The Barce series consists of moderately well drained soils on end moraines and ground moraines. These soils formed in silty deposits and in the underlying outwash and glacial till. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 12 percent.

Barce soils are similar to Corwin, Foresman, and Tippecanoe soils and are adjacent to Gilboa soils. Corwin soils have less sand in the upper part of the subsoil than the Barce soils. Foresman soils have less clay and more sand in the underlying material than the Barce soils. Tippecanoe soils have more sand and gravel in the lower part of the solum and in the underlying material than the Barce soils. Gilboa soils are grayer in the upper part of the solum than the Barce soils. They are in the lower areas.

Typical pedon of Barce silt loam, 0 to 2 percent slopes, in a cultivated field; 1,140 feet south and 180 feet east of the northwest corner of sec. 11, T. 24 N., R. 9 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine and very fine roots; strongly acid; abrupt wavy boundary.

A—6 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine and very fine roots; about 1 percent gravel; strongly acid; clear wavy boundary.

2Bt1—12 to 17 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; common fine and very fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 10 percent gravel; very strongly acid; clear wavy boundary.

2Bt2—17 to 31 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 20 percent gravel; strongly acid; gradual wavy boundary.

2Bt3—31 to 40 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; common fine distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; about 25 percent gravel; strongly acid; abrupt irregular boundary.

3Bt4—40 to 48 inches; yellowish brown (10YR 5/4) loam; few fine distinct brownish yellow (10YR 6/8) and few medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few very dark gray (10YR 3/1) iron and manganese accumulations; about 2 percent gravel; neutral; gradual wavy boundary.

3C—48 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct gray (10YR 5/1) and few fine distinct brownish yellow (10YR 6/8) mottles; massive; firm; few very dark gray (10YR 3/1) iron and manganese accumulations; about 3 percent gravel; slight effervescence; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It ranges from very strongly acid to neutral. The content of gravel is 0 to 10 percent in the upper part of this horizon and 10 to 25 percent in the lower part. It is 0 to 10 percent in the 3Bt and 3C horizons. The 3Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is neutral or mildly alkaline. The 3C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Billett Series

The Billett series consists of moderately well drained and well drained soils on ground moraines. These soils formed in outwash. Permeability is moderately rapid in the solum and rapid in the underlying material. Slopes range from 2 to 12 percent.

Billett soils are adjacent to Ayr Variant, Brems Variant, Darroch, and Seafield soils. Ayr Variant and Darroch soils have a dark surface layer that is thicker than that of the Billett soils and have more clay in the lower part of the solum. Ayr Variant and Brems Variant soils are in landscape positions similar to those of the Billett soils. Brems Variant soils have less clay in the subsoil than the Billett soils. Darroch and Seafield soils are grayer in the solum than the Billett soils. They are in the lower areas.

Typical pedon of Billett sandy loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,920 feet east and 560 feet south of the northwest corner of sec. 1, T. 25 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; mixed with brown (10YR 4/3) material from the subsoil; weak medium subangular blocky structure parting to weak medium granular; friable; common very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 11 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; friable; common very fine roots; few very dark grayish brown (10YR 3/2) root channels; thin continuous dark brown (10YR 3/3) clay films on faces of peds and in pores; medium acid; clear wavy boundary.

Bt2—11 to 24 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; friable; few very fine roots; few very dark grayish brown (10YR 3/2) root channels; thin continuous brown (10YR 4/3) clay films on faces of peds and clay bridges between sand grains; strongly acid; clear wavy boundary.

Bt3—24 to 32 inches; brown (7.5YR 5/4) sandy loam; weak fine subangular blocky structure; very friable; few very fine roots; few very dark grayish brown (10YR 3/2) root channels; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds and clay bridges between sand grains; about 2 percent gravel; strongly acid; gradual wavy boundary.

BC—32 to 39 inches; brown (7.5YR 5/4) loamy sand; weak medium subangular blocky structure; very friable; few very fine roots; thin strong brown (7.5YR 4/6) clay bridges between sand grains; about 2 percent gravel; medium acid; gradual wavy boundary.

C1—39 to 48 inches; dark yellowish brown (10YR 4/4) sand that has a few thin lamellae of strong brown (7.5YR 4/6) loamy sand; few fine distinct strong brown (7.5YR 5/8) mottles; single grain sand and massive loamy sand; loose sand and very friable loamy sand; about 1 percent gravel; few strata of light gray (10YR 7/1) uncoated sand grains; medium acid; clear wavy boundary.

C2—48 to 60 inches; dark yellowish brown (10YR 4/4) sand that has many lamellae of strong brown (7.5YR 4/6) loamy sand; common fine distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; single grain sand and massive loamy sand; loose sand and very friable loamy sand; about 1 percent gravel; common strata of light gray (10YR 7/1) uncoated sand grains; medium acid.

The solum is 30 to 50 inches thick. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is sandy loam or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly sandy loam or fine sandy loam, but in some pedons it has thin subhorizons of loam or sandy clay loam. It is slightly acid to strongly acid. The C horizon has value of 4 to 6. It is loamy sand, sand, loamy fine sand, or fine sand. It ranges from strongly acid to neutral.

Brems Variant

The Brems Variant consists of moderately well drained soils on beach ridges on ground moraines. These soils formed in outwash deposits. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 3 percent.

Brems Variant soils are commonly adjacent to Ayr Variant, Billett, and Seafield soils. Ayr Variant and Billett soils are in landscape positions similar to those of the Brems Variant soils. Ayr Variant soils have a dark surface layer that is thicker than that of the Brems Variant soils and have more clay in the lower part of the solum. Billett soils have more clay in the subsoil than the Brems Variant soils. Seafield soils are grayer in the solum than the Brems Variant soils. They are in the slightly lower areas.

Typical pedon of Brems Variant fine sandy loam, 0 to 3 percent slopes, in a cultivated field; 220 feet north and 1,960 feet west of the southeast corner of sec. 11, T. 26 N., R. 7 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; mixed with strong brown (7.5YR 4/6) material from the subsoil; weak medium subangular blocky structure parting to weak medium granular; very friable; few fine and medium roots; neutral; abrupt smooth boundary.

Bw1—7 to 10 inches; strong brown (7.5YR 4/6) fine sandy loam; weak medium subangular blocky structure; very friable; few fine and medium roots; many dark brown (10YR 3/3) krotovinas and root channels; neutral; clear wavy boundary.

Bw2—10 to 18 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; very friable; few fine and medium roots; few dark brown (10YR 3/3) krotovinas and root channels; slightly acid; clear wavy boundary.

Bw3—18 to 25 inches; strong brown (7.5YR 5/6) loamy fine sand; weak medium subangular blocky structure; very friable; few fine and medium roots; medium acid; gradual wavy boundary.

Bw4—25 to 31 inches; yellowish brown (10YR 5/4) fine sand; few fine distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; very friable; few fine and medium roots; medium acid; clear wavy boundary.

BC—31 to 38 inches; light yellowish brown (10YR 6/4) fine sand; many fine distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very friable; many strong brown (7.5YR 4/6) bands; strongly acid; clear wavy boundary.

C1—38 to 48 inches; light yellowish brown (10YR 6/4) loamy fine sand; common medium distinct light brownish gray (10YR 6/2), common medium faint pale brown (10YR 6/3), and many fine distinct yellowish brown (10YR 5/8) mottles; single grain;

loose; many strong brown (7.5YR 4/6) bands; strongly acid; clear wavy boundary.

C2—48 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand; many medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) and many fine distinct yellowish brown (10YR 5/8) mottles; single grain; loose; few white (10YR 8/1) lenses of uncoated sand grains; many strong brown (7.5YR 4/6) bands; strongly acid.

The solum is 35 to 50 inches thick. The A horizon has value of 3 to 5 and chroma of 2 to 4. The Bw and BC horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 to 6. It is strongly acid or medium acid.

Bryce Series

The Bryce series consists of poorly drained soils on end moraines. These soils formed in water-sorted deposits and the underlying glacial till. Permeability is moderately slow or slow in the upper part of the subsoil and slow or very slow in the lower part and in the underlying material. Slopes range from 0 to 2 percent.

Bryce soils are similar to Ashkum, Peotone, and Warners Variant soils and are adjacent to Swygert soils. Ashkum and Peotone soils have less clay in the lower part of the solum and in the underlying material than the Bryce soils. Peotone soils have a dark surface soil that is more than 24 inches thick. Warners Variant soils have a layer of marl and have less clay in the underlying material than the Bryce soils. Swygert soils are browner in the solum than the Bryce soils. They are on knolls and low rises.

Typical pedon of Bryce silty clay, in a cultivated field; 210 feet east and 90 feet south of the northwest corner of sec. 26, T. 26 N., R. 10 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine and very fine roots; medium acid; abrupt smooth boundary.

A—9 to 18 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; few very fine roots; medium acid; abrupt wavy boundary.

Btg1—18 to 24 inches; dark gray (5Y 4/1) silty clay; many fine distinct light yellowish brown (2.5Y 6/4) and few fine prominent yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; firm; few very fine roots; many black (10YR 2/1) root and worm channels and krotovinas; thin continuous grayish brown (2.5Y 5/2) clay films on faces of peds; slightly acid; clear wavy boundary.

Btg2—24 to 31 inches; olive gray (5Y 5/2) silty clay; many fine distinct light yellowish brown (2.5Y 6/4) mottles; moderate fine subangular blocky structure; firm; many black (10YR 2/1) root and worm channels and krotovinas; thin continuous dark gray (N 4/0) clay films on faces of peds; neutral; clear wavy boundary.

Btg3—31 to 45 inches; dark gray (5Y 4/1) silty clay; many fine distinct light olive brown (2.5Y 5/6) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (N 4/0) clay films on faces of peds; many black (10YR 2/1) krotovinas; a thin lens of light brownish gray (10YR 6/2) silty clay loam; neutral; clear irregular boundary.

2Btg4—45 to 50 inches; light olive gray (5Y 6/2) silty clay; many medium prominent yellowish brown (10YR 5/8) and many medium distinct light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; very firm; thin patchy grayish brown (2.5Y 5/2) clay films on faces of peds; common very dark gray (10YR 3/1) krotovinas; common white (10YR 8/1) accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

2Cg—50 to 60 inches; gray (5Y 6/1) silty clay; many medium distinct light olive brown (2.5Y 5/4) and light yellowish brown (2.5Y 6/4) and common medium prominent yellowish brown (10YR 5/8) mottles; massive; very firm; common very dark gray (10YR 3/1) krotovinas; common white (10YR 8/1) accumulations of carbonate; slight effervescence; moderately alkaline.

The solum is 45 to 55 inches thick. The water-sorted deposits are 35 to 50 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or it is neutral in hue and has value of 2 or 3. It is silty clay loam or silty clay. The Btg horizon has hue of 2.5Y or 5Y, value of 2 to 6, and chroma of 1 to 3, or it is neutral in hue and has value of 2 to 6. Value of 2 or 3 is limited to the upper few inches of the horizon. This horizon is slightly acid to mildly alkaline. The 2Btg and 2Cg horizons are silty clay loam or silty clay. The 2Btg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. It is neutral to moderately alkaline. The 2Cg horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 to 4. It is mildly alkaline or moderately alkaline.

Chalmers Series

The Chalmers series consists of poorly drained soils on end moraines and ground moraines. These soils formed in loess and silty deposits and in the underlying glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Chalmers soils are similar to Ashkum, Drummer, Selma, and Wolcott soils and are adjacent to Conover, Lisbon, and Odell soils. Ashkum soils have more clay in the solum than the Chalmers soils. Drummer soils are stratified in the underlying material. Odell, Selma, and Wolcott soils have more sand in the solum than the Chalmers soils. Conover, Lisbon, and Odell soils are browner in the solum than the Chalmers soils. They are on the slightly higher knolls and rises.

Typical pedon of Chalmers silty clay loam, in a cultivated field; 1,560 feet east and 110 feet north of the southwest corner of sec. 4, T. 24 N., R. 6 W.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; common fine and very fine roots; neutral; abrupt wavy boundary.

Bg1—12 to 20 inches; gray (10YR 5/1) silty clay loam; many fine distinct light yellowish brown (2.5Y 6/4), many medium distinct olive yellow (2.5Y 6/8), and many coarse distinct light gray (10YR 7/1) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; few fine and very fine roots; many very dark grayish brown (10YR 3/2) root channels; thin patchy very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

Bg2—20 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine distinct olive yellow (2.5Y 6/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; friable; few fine and very fine roots; many very dark grayish brown (10YR 3/2) root channels; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; neutral; clear irregular boundary.

2BCg—34 to 48 inches; gray (10YR 6/1) loam; many fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin patchy very dark gray (10YR 3/1) organic coatings on faces of peds; about 1 percent gravel; common very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; clear wavy boundary.

2Cg—48 to 60 inches; gray (10YR 6/1) loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; about 8 percent gravel; common very dark gray (10YR 3/1) krotovinas; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess or silty deposits are 20 to 40 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bg and 2BCg horizons are neutral or mildly alkaline. The Bg horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2, or it is neutral in hue and has value of 3 to 6. Value of 3 is limited to the upper few inches of the horizon. The 2BCg and 2Cg horizons are silt loam or loam. The 2BCg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4. It is mildly alkaline or moderately alkaline.

Comfrey Series

The Comfrey series consists of very poorly drained soils on flood plains. These soils formed in alluvium and in the underlying outwash. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Comfrey soils are adjacent to Crane, Free, Rush, Tippecanoe, and Wea soils. Crane, Rush, Tippecanoe, and Wea soils are browner in the solum than the Comfrey soils. They are on outwash plains or terraces. Free soils have a dark surface soil that is less than 24 inches thick. They are in the slightly higher areas.

Typical pedon of Comfrey silty clay loam, sandy substratum, occasionally flooded, in a cultivated field; 400 feet west and 100 feet north of the southeast corner of sec. 21, T. 26 N., R. 9 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine and very fine roots; about 1 percent gravel; mildly alkaline; abrupt smooth boundary.

A1—6 to 19 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common fine and very fine roots; about 1 percent gravel; neutral; clear wavy boundary.

A2—19 to 32 inches; very dark gray (N 3/0) clay loam, very dark grayish brown (2.5Y 3/2) dry; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and very fine roots; about 1 percent gravel; neutral; clear wavy boundary.

Bg—32 to 46 inches; dark gray (5Y 4/1) loam; common coarse distinct dark grayish brown (2.5Y 4/2) mottles; weak medium subangular blocky structure; friable; about 1 percent gravel; few thin lenses of grayish brown (10YR 5/2) sand; neutral; clear wavy boundary.

2Cg—46 to 60 inches; dark gray (5Y 4/1) gravelly coarse sand; common coarse distinct light olive brown (2.5Y 5/4) mottles; single grain; loose; about 16 percent gravel; common thin strata of very dark gray (10YR 3/1) gravelly loamy sand; slight effervescence; moderately alkaline.

The solum is 40 to 55 inches thick. The mollic epipedon is 24 to 36 inches thick.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1, or it is neutral in hue and has value of 2 or 3. It is silt loam, loam, silty clay loam, or clay loam. The content of gravel in this horizon is 0 to 5 percent. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is neutral or mildly alkaline. It is loam or clay loam. The content of gravel in this horizon is 0 to 10 percent. The 2Cg horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. It is sand, loamy sand, coarse sand, loamy coarse sand, or the gravelly analogs of these textures. The content of gravel in this horizon ranges from 5 to 35 percent.

Conover Series

The Conover series consists of somewhat poorly drained, moderately slowly permeable soils on ground moraines. These soils formed in silty deposits and the underlying glacial till. Slopes range from 0 to 3 percent.

Conover soils are similar to Odell and Whitaker soils and are adjacent to Chalmers, Miami, and Montmorenci soils. Odell and Chalmers soils have a dark surface layer that is thicker than that of the Conover soils. Also, Chalmers soils have a grayer solum. They are poorly drained and are in depressional areas. Whitaker soils have a surface layer that is lighter colored than that of the Conover soils and have less clay in the underlying material. Miami and Montmorenci soils are browner in the solum than the Conover soils. They are in the higher areas.

Typical pedon of Conover silt loam, 0 to 3 percent slopes, in a cultivated field; 300 feet west and 2,600 feet north of the southeast corner of sec. 19, T. 25 N., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak fine granular; friable; many fine and few medium roots; neutral; abrupt smooth boundary.

Bt1—8 to 12 inches; brown (10YR 5/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; many fine and few medium roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; very dark grayish brown (10YR 3/2) organic stains on faces of peds; many dark grayish brown (10YR 4/2) krotovinas; slightly acid; abrupt smooth boundary.

2Bt2—12 to 17 inches; brown (10YR 5/3) clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; few fine roots; medium continuous dark grayish brown (10YR 4/2) clay films on faces of peds and along root channels; common very dark grayish brown (10YR 3/2) organic stains and coatings along root channels; medium acid; clear wavy boundary.

2Bt3—17 to 24 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; medium continuous dark grayish brown (10YR 4/2) clay films on faces of peds and along root channels; common very dark grayish brown (10YR 3/2) organic stains and coatings along root channels; medium acid; clear wavy boundary.

2BC—24 to 30 inches; yellowish brown (10YR 5/4) loam; common medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; medium coarse subangular blocky structure; friable; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) organic stains and coatings along root channels; slight effervescence; mildly alkaline; gradual irregular boundary.

2C1—30 to 40 inches; light olive brown (2.5Y 5/4) loam; common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; massive; firm; common yellowish red (5YR 5/8) accumulations of iron; many white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—40 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; common yellowish red (5YR 5/8) accumulations of iron; common white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam or silt loam. The Bt and 2Bt horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. They are medium acid to neutral. The 2Bt horizon is loam, clay loam, or silty clay loam. The 2BC horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is loam or clay loam. It is neutral or mildly alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Corwin Series

The Corwin series consists of moderately well drained soils on ground moraines and end moraines. These soils formed in glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 12 percent.

Corwin soils are similar to Barce, Markham, Montmorenci, and Varna soils and are adjacent to Lisbon, Odell, and Wolcott soils. Barce, Markham, and Varna soils are in positions on the landscape similar to those of the Corwin soils. Barce soils have more sand in the upper part of the subsoil than the Corwin soils, and Markham and Varna soils have more clay in the subsoil.

Montmorenci soils have a dark surface layer that is thinner than that of the Corwin soils. They are in the slightly higher areas. Lisbon and Odell soils are in the lower areas. They are grayer in the upper part of the subsoil than the Corwin soils. Also, Lisbon soils have less sand in the solum. Wolcott soils are grayish throughout. They are somewhat poorly drained and are in depressional areas.

Typical pedon of Corwin silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 380 feet west and 520 feet north of the southeast corner of sec. 29, T. 25 N., R. 8 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with yellowish brown (10YR 5/4) clay loam from the subsoil; moderate medium subangular blocky structure parting to moderate medium granular; friable; many very fine roots; about 1 percent gravel; medium acid; abrupt smooth boundary.

Bt1—11 to 15 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; common very fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; about 8 percent gravel; few very dark gray (10YR 3/1) worm casts and root channels; strongly acid; clear wavy boundary.

Bt2—15 to 22 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; common very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 9 percent gravel; few dark grayish brown (10YR 4/2) worm casts and root channels; strongly acid; clear wavy boundary.

Bt3—22 to 26 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; about 4 percent gravel; few dark grayish brown (10YR 4/2) worm casts and root channels; slightly acid; clear wavy boundary.

Bt4—26 to 30 inches; brown (10YR 4/3) clay loam; few medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 4 percent gravel; few dark grayish brown (10YR 4/2) worm casts and root channels; mildly alkaline; clear wavy boundary.

C1—30 to 40 inches; light olive brown (2.5Y 5/4) loam; few medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8), and few fine prominent red (2.5YR 4/8) mottles; massive; firm; about 7 percent gravel; few white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct light brownish gray (10YR 6/2), few medium distinct yellowish brown (10YR 5/8), and few fine prominent red (2.5YR 4/8) mottles; massive; firm; about 6 percent gravel; few yellowish red (5YR 5/8) accumulations of iron; common white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is dominantly loam or clay loam, but in some pedons the upper part is silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is loam or silt loam. It is mildly alkaline or moderately alkaline.

Crane Series

The Crane series consists of somewhat poorly drained soils on outwash plains and terraces. These soils formed in outwash deposits. Permeability is moderate in the solum. It generally is very rapid in the underlying material. In the till substratum phase, however, it is very rapid in the upper part of the underlying material and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Crane soils are similar to Darroch and Gilboa soils and are adjacent to Comfrey, Drummer, Free, Rush, and Wea soils. Darroch soils have a solum that is thinner than that of the Crane soils and have less gravel in the subsoil and underlying material. Gilboa soils have less sand and gravel in the lower part of the solum and in the underlying material than the Crane soils. Comfrey, Drummer, and Free soils are grayer in the solum than the Crane soils. Comfrey soils are on flood plains. The poorly drained Drummer and very poorly drained Free soils are in depressional areas. Rush and Wea soils are browner in the solum than the Crane soils. They are on the higher flats.

Typical pedon of Crane silt loam, in a cultivated field; 600 feet east and 140 feet north of the southwest corner of sec. 33, T. 26 N., R. 9 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common medium and fine roots; about 3 percent gravel; slightly acid; abrupt smooth boundary.

A—10 to 15 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; common medium and fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.

Bt1—15 to 21 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct light olive brown (2.5Y 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent gravel; common black (10YR 2/1) worm channels; many very dark grayish brown (10YR 3/2) krotovinas; neutral; clear wavy boundary.

Bt2—21 to 36 inches; dark yellowish brown (10YR 4/4) clay loam; many medium distinct strong brown (7.5YR 5/6), common medium faint dark yellowish brown (10YR 4/6), and few medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; many very dark grayish brown (10YR 3/2) krotovinas; neutral; gradual wavy boundary.

2Bt3—36 to 49 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; many medium distinct strong brown (7.5YR 5/8) and common medium faint dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 20 percent gravel; many very dark grayish brown (10YR 3/2) krotovinas; neutral; gradual wavy boundary.

2Bt4—49 to 53 inches; brown (10YR 5/3) gravelly sandy clay loam; many medium distinct brownish yellow (10YR 6/8) and strong brown (7.5YR 5/8) and common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 20 percent gravel; many very dark grayish brown (10YR 3/2) krotovinas; neutral; abrupt irregular boundary.

3C—53 to 60 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand; single grain; loose; about 40 percent gravel; many very dark grayish brown (10YR 3/2) krotovinas; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt and 2Bt horizons are slightly acid or neutral. The Bt horizon has value of 4 to 6 and chroma of 1 to 6. It is loam or clay loam. The content of gravel in this horizon is 0 to 10 percent. The 2Bt horizon has colors similar to those of the Bt horizon. It is gravelly sandy clay loam or gravelly sandy loam. The content of gravel in this horizon is 15 to 30 percent. The 3C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is mildly alkaline or moderately alkaline. It is the gravelly or very gravelly analogs of coarse sand or loamy coarse sand. The content of gravel in this horizon ranges from 15 to 50 percent. A till substratum phase is mapped in the county.

Darroch Series

The Darroch series consists of somewhat poorly drained soils on outwash plains in areas of ground moraines and end moraines. These soils formed in outwash deposits. Permeability is moderate in the solum and generally is moderately slow in the underlying material. The moderately fine substratum phase, however, is slowly permeable or moderately slowly permeable in the lower part of the underlying material. Slopes range from 0 to 2 percent.

Darroch soils are similar to Crane, Gilboa, and Whitaker soils and are adjacent to Billett, Foresman, and Selma soils. Crane soils have a solum that is thicker than that of the Darroch soils and have more gravel in the subsoil and underlying material. Gilboa soils have more clay and less sand in the underlying material than the Darroch soils. Whitaker soils have a surface layer that is lighter colored than that of the Darroch soils. Billett and Foresman soils are browner in the upper part of the subsoil than the Darroch soils. They are in the higher areas. Selma soils are grayer in the subsoil than the Darroch soils. They are poorly drained and are in depressional areas.

Typical pedon of Darroch silt loam, in a cultivated field; 2,600 feet east and 60 feet south of the northwest corner of sec. 10, T. 25 N., R. 8 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many very fine roots; neutral; abrupt wavy boundary.

A—11 to 15 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; many very fine roots; neutral; clear wavy boundary.

2Btg1—15 to 21 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4) and few medium distinct dark gray (10YR 4/1) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common very dark gray (10YR 3/1) root channels; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

2Btg2—21 to 29 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few very fine roots; common dark gray (10YR 4/1) root channels; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

2C1—29 to 46 inches; yellowish brown (10YR 5/4) stratified silt loam and fine sand; many medium distinct gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; few dark grayish brown (10YR 4/2) root channels; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—46 to 60 inches; yellowish brown (10YR 5/4) stratified silt loam and fine sand; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) and few medium distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; few black (N 2/0) iron and manganese accumulations; common gray (10YR 5/1) lenses of silty clay loam; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The 2Btg horizon has value of 4 to 6 and chroma of 1 to 6. It is medium acid to neutral. It is clay loam, silty clay loam, or loam in the upper part and loam, clay loam, or sandy clay loam in the lower part. The 2C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 6. It is stratified sand to silt loam. It is mildly alkaline or moderately alkaline. A till substratum phase and a moderately fine substratum phase are mapped in the county.

Drummer Series

The Drummer series consists of poorly drained soils on outwash plains in areas of end moraines and ground moraines. These soils formed in silty deposits and outwash deposits. Permeability generally is moderate throughout the profile. The gravelly substratum phase, however, is very rapidly permeable in the underlying material. Slopes range from 0 to 2 percent.

Drummer soils are similar to Chalmers and Free soils and are adjacent to Crane and Houghton soils. Chalmers soils are not stratified in the underlying material. Free soils have more gravel throughout than the Drummer soils. Crane soils have more sand than the Drummer soils and have a browner solum. They are on rises. Houghton soils are organic throughout. They are in the lower areas.

Typical pedon of Drummer silty clay loam, in a cultivated field; 75 feet west and 1,600 feet south of the northeast corner of sec. 27, T. 24 N., R. 8 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; few very fine roots; mildly alkaline; clear wavy boundary.

Bg1—14 to 22 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine prismatic structure parting to strong fine subangular blocky; firm; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; many very dark gray (10YR 3/1) krotovinas; mildly alkaline; clear wavy boundary.

Bg2—22 to 32 inches; gray (10YR 5/1) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) and common fine faint light gray (10YR 6/1) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; mildly alkaline; clear wavy boundary.

Bg3—32 to 40 inches; gray (10YR 5/1) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; mildly alkaline; clear wavy boundary.

2BCg—40 to 53 inches; gray (10YR 5/1) silt loam; many fine distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common very dark gray (10YR 3/1) krotovinas; yellowish brown (10YR 5/6) lenses of fine sandy loam; moderately alkaline; gradual wavy boundary.

2Cg—53 to 60 inches; light gray (10YR 6/1) silt loam; many medium distinct yellowish brown (10YR 5/6), common fine distinct strong brown (7.5YR 5/8), and common fine faint gray (10YR 5/1) mottles; massive; friable; few dark gray (10YR 4/1) krotovinas; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) lenses of sandy loam; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 42 to 65 inches thick. The silty deposits are 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. The Bg horizon has hue of 10YR, 2.5Y, or 5Y and chroma of 1 or 2. It generally has value of 4 to 6, but in some pedons it has value of 3 in the upper part. It is slightly acid to mildly alkaline. The 2BCg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 4. It is dominantly silt loam or loam but commonly has strata of clay loam, silty clay loam, sandy loam, or fine sandy loam. It is neutral to moderately alkaline. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 6. It is stratified silty clay loam to sandy loam. It is mildly alkaline or moderately alkaline. A gravelly substratum phase and a stratified sandy substratum phase are mapped in the county.

Elliott Series

The Elliott series consists of somewhat poorly drained soils on ground moraines and end moraines. These soils formed in glacial till. Permeability is moderately slow in the solum and moderately slow or slow in the underlying material. Slopes range from 0 to 4 percent.

Elliott soils are similar to Andres and Swygert soils and are adjacent to Ashkum, Markham, and Varna soils. Andres soils have less clay in the solum than the Elliott soils. Swygert soils have more clay in the subsoil than the Elliott soils. Ashkum soils are grayer in the solum than the Elliott soils. They are poorly drained and are in depressional areas. Markham and Varna soils are browner in the upper part of the solum than the Elliott soils. They are in the higher areas.

Typical pedon of Elliott silt loam, 2 to 4 percent slopes, eroded, in a cultivated field; 115 feet west and 312 feet south of the center of sec. 15, T. 26 N., R. 8 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; mixed with dark yellowish brown (10YR 4/4) silty clay loam from the subsoil; moderate medium subangular blocky structure parting to moderate medium granular; friable; few very fine roots; neutral; abrupt wavy boundary.

Bt1—10 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; many very dark grayish brown (10YR 3/2) root and worm channels; neutral; clear wavy boundary.

Bt2—15 to 24 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very dark grayish brown (10YR 3/2) root channels; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

Bt3—24 to 30 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct brownish yellow (10YR 6/6), few fine distinct strong brown (7.5YR 5/8), and many fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very dark grayish brown (10YR 3/2) root channels; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bt4—30 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

C—33 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; massive; firm; about 3 percent gravel; common light gray (10YR 7/1) accumulations of carbonate; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The A 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 to 4. It is clay loam, silty clay, or silty clay loam. It generally is medium acid to neutral but ranges to mildly alkaline in the lower part. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4. It is mildly alkaline or moderately alkaline.

Foresman Series

The Foresman series consists of moderately well drained soils on outwash plains in areas of ground moraines and end moraines. These soils formed in outwash deposits. Permeability is moderate in the solum and generally is moderately slow in the underlying material. The moderately fine substratum phase, however, is slowly permeable or moderately slowly permeable in the lower part of the underlying material. Slopes range from 1 to 5 percent.

Foresman soils are similar to Barce and Tippecanoe soils and are adjacent to Darroch soils. Barce soils have more clay and less sand in the underlying material than the Foresman soils. Tippecanoe soils have a solum that is thicker than that of the Foresman soils and have more gravel in the subsoil and underlying material. Darroch soils are grayer in the upper part of the subsoil than the Foresman soils. They are in the slightly lower areas.

Typical pedon of Foresman silt loam, 1 to 5 percent slopes, eroded, in a cultivated field; 960 feet east and 2,600 feet north of the southwest corner of sec. 27, T. 25 N., R. 7 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with dark yellowish brown (10YR 4/4) clay loam from the subsoil; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 21 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; friable; few fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; few very dark grayish brown (10YR 3/2) krotovinas; medium acid; gradual smooth boundary.

Bt2—21 to 29 inches; dark yellowish brown (10YR 4/4) sandy clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; few black (N 2/0) iron and manganese oxide accumulations and stains; few very dark grayish brown (10YR 3/2) krotovinas; slightly acid; clear wavy boundary.

Bt3—29 to 35 inches; brown (10YR 5/3) clay loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) and few fine distinct strong brown (7.5YR 4/6) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; friable; few very fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; many black (N 2/0) iron and manganese oxide accumulations and stains; few very dark grayish brown (10YR 3/2) krotovinas; slightly acid; clear wavy boundary.

Bt4—35 to 39 inches; grayish brown (10YR 5/2) clay loam; common medium distinct strong brown (7.5YR 5/8) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate very coarse prismatic structure; friable; thin continuous grayish brown (10YR 5/2) clay films on vertical faces of peds; few very dark grayish brown (10YR 3/2) krotovinas; neutral; abrupt wavy boundary.

C—39 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam that has thin strata of yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) sand; common fine distinct gray (10YR 6/1), common medium distinct strong brown (7.5YR 4/6), and many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few very dark grayish brown (10YR 3/2) krotovinas; slight effervescence; mildly alkaline.

The solum ranges from 24 to 40 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Chroma of 2 is limited to the lower part. This horizon is dominantly clay loam, loam, or sandy clay loam, but in some pedons it is silt loam or silty clay loam in the upper part. It ranges from strongly acid to neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is dominantly silt loam or loam, but it has strata that are coarser textured than sandy loam. It is mildly alkaline or moderately alkaline. A till substratum phase and a moderately fine substratum phase are mapped in the county.

Free Series

The Free series consists of very poorly drained soils on outwash terraces. These soils formed in outwash deposits. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

Free soils are similar to Drummer and Selma soils and are adjacent to Comfrey, Crane, and Wea soils. Drummer and Selma soils have less gravel in the lower part of the solum and in the underlying material than the Free soils. Comfrey soils are dark to a depth of more than 24 inches. They are on flood plains. Crane and Wea soils are browner in the solum than the Free soils. They are in the higher areas.

Typical pedon of Free clay loam, in a cultivated field; 500 feet west and 1,000 feet north of the southeast corner of sec. 32, T. 26 N., R. 9 W.

Ap—0 to 8 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; common very fine roots; about 7 percent gravel; medium acid; abrupt smooth boundary.

A—8 to 16 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common very fine roots; about 5 percent gravel; slightly acid; clear wavy boundary.

Btg1—16 to 21 inches; dark gray (10YR 4/1) clay loam; common fine distinct grayish brown (10YR 5/2), few fine distinct strong brown (7.5YR 5/8), and many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many black (10YR 2/1) krotovinas; about 10 percent gravel; neutral; clear wavy boundary.

Btg2—21 to 31 inches; dark gray (10YR 4/1) loam; many fine distinct yellowish brown (10YR 5/6), few fine distinct strong brown (7.5YR 5/8), and common fine faint gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many black (10YR 2/1) krotovinas; about 12 percent gravel; neutral; clear wavy boundary.

2Btg3—31 to 40 inches; gray (10YR 5/1) gravelly loam; many medium distinct yellowish brown (10YR 5/8), few fine distinct strong brown (7.5YR 5/8), and common medium faint dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 15 percent gravel; many black (10YR 2/1) krotovinas; neutral; gradual wavy boundary.

2Btg4—40 to 48 inches; gray (10YR 5/1) gravelly loam; common fine faint grayish brown (10YR 5/2), common medium distinct yellowish brown (10YR 5/8), and common medium faint dark gray (10YR 4/1) mottles; weak medium subangular blocky structure; friable; thin patchy dark gray (10YR 4/1) clay films on faces of peds; few dark reddish brown (5YR 3/4) accumulations of iron; many black (10YR 2/1) krotovinas; about 25 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2BCg—48 to 52 inches; gray (10YR 5/1) gravelly sandy loam; few fine distinct strong brown (7.5YR 5/8) and many medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very friable; many black (10YR 2/1) krotovinas; about 30 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

2C—52 to 60 inches; brown (10YR 5/3) very gravelly loamy coarse sand; many medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; single grain; loose; few very dark gray (10YR 3/1) krotovinas; about 45 percent gravel; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The content of gravel ranges from 0 to 15 percent in the Btg horizon, from 15 to 30 percent in the 2Btg horizon, from 15 to 40 percent in the 2BCg horizon, and from 15 to 50 percent in the 2C horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2, or it is neutral in hue and has value of 4 or 5. It is slightly acid or neutral. The 2Btg horizon has colors similar to those of the Btg horizon. It is gravelly loam or gravelly clay loam. The 2BCg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is neutral to moderately alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 4. It is the gravelly or very gravelly analogs of coarse sand or loamy coarse sand. It is mildly alkaline or moderately alkaline.

Gilboa Series

The Gilboa series consists of somewhat poorly drained soils on end moraines and ground moraines. These soils formed in silty material and in the underlying loamy outwash and glacial till. Permeability is moderate in the upper part of the solum and moderately slow in the lower part and in the underlying material. Slopes range from 0 to 4 percent.

Gilboa soils are similar to Andres, Crane, Darroch, and Odell soils and are adjacent to Barce, Selma, and Wallkill Variant soils. Andres soils have more clay in the lower part of the solum and in the underlying material than the Gilboa soils, Crane soils have more sand and gravel in the lower part of the solum, Darroch soils have less clay and more sand in the underlying material, and Odell soils have less sand in the upper part of the subsoil. Barce soils are browner in the upper part of the solum than the Gilboa soils. They are in the higher areas. Selma and Wallkill Variant soils are grayer in the solum than the Gilboa soils. Also, they are more poorly drained and are in depressional areas. Wallkill Variant soils are underlain by organic material.

Typical pedon of Gilboa silt loam, 0 to 2 percent slopes, in a cultivated field; 700 feet east and 850 feet north of the southwest corner of sec. 4, T. 24 N., R. 8 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common very fine roots; medium acid; abrupt smooth boundary.

A—9 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; few very fine roots; medium acid; clear wavy boundary.

Bt1—11 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few very fine roots; about 1 percent gravel; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) fillings in old root channels; medium acid; clear wavy boundary.

2Bt2—19 to 29 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few very fine roots; about 7 percent gravel; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) fillings in old root channels; medium acid; gradual wavy boundary.

2Bt3—29 to 39 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; about 3 percent gravel; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common very dark grayish brown (10YR 3/2) accumulations of organic material; neutral; abrupt wavy boundary.

3Bt4—39 to 45 inches; light olive brown (2.5Y 5/4) loam; many fine distinct yellowish brown (10YR 5/8) and many medium distinct light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure;

firm; few very fine roots; about 5 percent gravel; thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds; few light gray (10YR 7/1) accumulations of calcium carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

3C—45 to 60 inches; light olive brown (2.5Y 5/4) loam; common fine distinct yellowish brown (10YR 5/6) and common fine faint grayish brown (2.5Y 5/2) mottles; massive; firm; about 2 percent gravel; thin discontinuous grayish brown (2.5Y 5/2) clay flows on faces of vertical cracks; few yellowish red (5YR 5/6) accumulations of iron; common light gray (10YR 7/1) accumulations of calcium carbonate; strong effervescence; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 or 2. The 2Bt horizon has value of 4 or 5 and chroma of 2 to 6. It is loam or clay loam. The content of gravel ranges from 3 to 15 percent in this horizon. It ranges from 0 to 10 percent in the 3Bt and 3C horizons. The 3Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is neutral to moderately alkaline. The 3C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6. It is mildly alkaline or moderately alkaline.

Houghton Series

The Houghton series consists of very poorly drained soils on ground moraines. These soils formed in organic deposits. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Houghton soils are similar to Wallkill Variant soils and are adjacent to Drummer soils. Wallkill Variant soils formed mineral deposits less than 40 inches deep over organic deposits. Drummer soils formed in mineral material in the slightly higher areas.

Typical pedon of Houghton muck, in a cultivated field; 200 feet east and 2,500 feet north of the southwest corner of sec. 16, T. 25 N., R. 8 W.

Op—0 to 9 inches; sapric material, black (10YR 2/1) broken face, very dark gray (10YR 3/1) rubbed; about 40 percent fiber, 4 percent rubbed; moderate medium granular structure; friable; many fine and very fine roots; mostly herbaceous fiber; about 4 percent mineral material; slightly acid; abrupt wavy boundary.

Oa1—9 to 14 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 42 percent fiber, 4 percent rubbed; moderate fine subangular blocky structure; friable; many fine and very fine roots; mostly herbaceous fiber; about 4 percent mineral material; slightly acid; abrupt wavy boundary.

Oa2—14 to 27 inches; sapric material, very dark brown (10YR 2/2) broken face and rubbed; about 38 percent fiber, 2 percent rubbed; moderate medium subangular blocky structure; friable; many fine and very fine roots; mostly herbaceous fiber; about 3 percent mineral material; slightly acid; clear wavy boundary.

Oa3—27 to 34 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 42 percent fiber, 11 percent rubbed; moderate thick platy structure; friable; common very fine roots; mostly herbaceous fiber; about 1 percent mineral material; neutral; clear wavy boundary.

Oa4—34 to 46 inches; sapric material, dark brown (7.5YR 3/2) broken face, very dark brown (10YR 2/2) rubbed; about 32 percent fiber, 8 percent rubbed; weak medium platy structure; friable; mostly herbaceous fiber; about 1 percent mineral material; neutral; gradual wavy boundary.

Oa5—46 to 60 inches; sapric material, dark brown (7.5YR 3/2) broken face, very dark brown (10YR 2/2) rubbed; about 42 percent fiber, 10 percent rubbed; moderate medium platy structure; friable; mostly herbaceous fiber; about 1 percent mineral material; neutral.

The organic material is more than 51 inches thick. It ranges from medium acid to mildly alkaline. It is primarily herbaceous.

The surface tier has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. The content of fiber in this tier is dominantly less than 5 percent after rubbing. The mineral content is as much as 10 percent. The subsurface and bottom tiers have hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3, or they are neutral in hue and have value of 2 or 3. They are primarily sapric material. Some pedons, however, have thin layers of hemic material that total less than 10 inches in thickness. The content of fiber in these tiers is dominantly less than 12 percent after rubbing. The mineral content is as much as 4 percent.

Lisbon Series

The Lisbon series consists of somewhat poorly drained soils on ground moraines. These soils formed in silty deposits and the underlying glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 2 percent.

Lisbon soils are similar to Odell soils and are adjacent to Chalmers and Corwin soils. Odell soils have more sand in the subsoil than the Lisbon soils. Chalmers soils are grayer in the solum than the Lisbon soils. They are in depressional areas. Corwin soils have more sand in the solum than the Lisbon soils and are browner in the upper part of the solum. They are on the higher swells.

Typical pedon of Lisbon silt loam, 0 to 2 percent slopes, in a cultivated field; 640 feet east and 140 feet south of the northwest corner of sec. 25, T. 25 N., R. 10 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

A—9 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common very fine roots; slightly acid; clear wavy boundary.

BA—12 to 15 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct brown (10YR 5/3) mottles; weak very fine subangular blocky structure parting to moderate fine granular; friable; few very fine roots; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark grayish brown (10YR 3/2) root channels; slightly acid; clear wavy boundary.

Bt1—15 to 30 inches; brown (10YR 5/3) silty clay loam; many fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark grayish brown (10YR 3/2) root channels; neutral; clear wavy boundary.

2Bt2—30 to 35 inches; light olive brown (2.5Y 5/4) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; about 3 percent gravel; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark grayish brown (10YR 3/2) root channels; neutral; clear wavy boundary.

2Bt3—35 to 38 inches; light olive brown (2.5Y 5/4) silty clay loam; many fine distinct grayish brown (10YR 5/2), many medium distinct yellowish brown (10YR 5/6), and common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm; about 4 percent gravel; thin patchy gray (10YR 5/1) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few very dark grayish brown (10YR 3/2) root channels; slight effervescence; mildly alkaline; gradual wavy boundary.

2C—38 to 60 inches; light olive brown (2.5Y 5/4) silt loam; few fine prominent strong brown (7.5YR 5/8) and few fine distinct gray (10YR 6/1) mottles; massive; firm; about 6 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick. The silty deposits are 20 to 40 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt, 2Bt, and 2C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. The Bt horizon is slightly acid or neutral. The 2Bt horizon is loam, clay loam, or silty clay loam. It is slightly acid to mildly alkaline. The 2C horizon is silt loam or loam. It is mildly alkaline or moderately alkaline.

Markham Series

The Markham series consists of moderately well drained soils on ground moraines and end moraines. These soils formed in glacial till. Permeability is moderately slow or slow. Slopes range from 2 to 6 percent.

Markham soils are similar to Corwin, Montmorenci, and Varna soils and are adjacent to Ashkum and Elliott soils. Corwin and Varna soils have a dark surface layer that is thicker than that of the Markham soils. Corwin and Montmorenci soils have less clay in the subsoil than the Markham soils. Ashkum soils are grayer in the subsoil than the Markham soils. They are in depressional areas. Elliott soils are grayer in the upper part of the solum than the Markham soils. They are in the slightly lower areas.

Typical pedon of Markham silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,040 feet east and 2,140 feet south of the northwest corner of sec. 16, T. 26 N., R. 8 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with yellowish brown (10YR 5/4) silty clay loam from the subsoil; weak medium subangular blocky structure; friable; few medium and many fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; friable; few fine and very fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—17 to 22 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; few yellowish red (5YR 5/8) accumulations of iron; slightly acid; clear wavy boundary.

Bt3—22 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel;

common yellowish red (5YR 5/8) accumulations of iron; slightly acid; clear wavy boundary.

Bt4—27 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) and few fine distinct brownish yellow (10YR 6/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; common yellowish red (5YR 5/8) accumulations of iron; neutral; clear wavy boundary.

C1—34 to 45 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) and common medium faint light olive brown (2.5Y 5/6) mottles; massive; firm; about 5 percent gravel; few white (10YR 8/1) accumulations of carbonate; common yellowish red (5YR 5/8) accumulations of iron; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—45 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct gray (5Y 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; about 5 percent gravel; common white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The A horizon has chroma of 1 or 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. It has chroma of 3 or 4 in the upper part and chroma of 2 to 4 in the lower part. It is medium acid to neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4.

Miami Series

The Miami series consists of well drained soils on ground moraines and end moraines. These soils formed in loess and silty deposits and in the underlying glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 20 percent.

Miami soils are similar to Montmorenci soils and are adjacent to Conover soils. Montmorenci soils have a surface layer that is darker than that of the Miami soils. Conover soils are grayer in the solum than the Miami soils. They are in the slightly lower areas.

Typical pedon of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 200 feet west and 1,900 feet south of the northeast corner of sec. 20, T. 25 N., R. 6 W.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/6) material from the subsoil; weak fine granular structure; friable; many fine and few medium roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; few fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and along root channels; few dark grayish brown (10YR 4/2) krotovinas; few light gray (10YR 7/1) silt coatings along root channels; medium acid; abrupt wavy boundary.

2Bt2—10 to 17 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; medium discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; few yellowish brown (10YR 5/8) accumulations of iron; strongly acid; clear wavy boundary.

2Bt3—17 to 26 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; medium discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; few yellowish red (5YR 5/8) accumulations of iron; common very dark gray (10YR 3/1) organic stains on faces of peds and along root channels; medium acid; clear wavy boundary.

2BC—26 to 30 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; thin patchy dark brown (10YR 4/3) clay films on faces of peds and as linings of voids; few yellowish red (5YR 5/8) accumulations of iron and few yellowish brown (10YR 5/6) stains; common very dark gray (10YR 3/1) organic stains on faces of peds and along root channels; slight effervescence; mildly alkaline; clear irregular boundary.

2C—30 to 60 inches; light olive brown (2.5Y 5/4) loam; few fine distinct brownish yellow (10YR 6/8) and common medium faint light olive brown (2.5Y 5/6) mottles; massive; firm; common yellowish red (5YR 5/8) accumulations of iron; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon is silt loam, loam, or clay loam. The Ap horizon has value of 3 to 5 and chroma of 2 or 3. When dry, it has chroma of 2 or 3. In uncultivated areas the A horizon has hue of 10YR, value of 3, and chroma of 1 or 2. The 2Bt horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is strongly acid to slightly acid. The 2BC horizon has colors similar to those of the 2Bt horizon. It is neutral or mildly alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Montmorenci Series

The Montmorenci series consists of moderately well drained soils on end moraines and ground moraines.

These soils formed in glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 2 to 6 percent.

Montmorenci soils are similar to Corwin, Markham, and Miami soils and are adjacent to Conover and Peotone soils. Corwin soils have a dark surface layer that is thicker than that of the Montmorenci soils. Markham soils have more clay in the subsoil than the Montmorenci soils. They are in the slightly higher areas. Miami soils have a surface layer that is lighter colored than that of the Montmorenci soils. Conover and Peotone soils are more grayish in the upper part of the solum than the Montmorenci soils and have more clay in the subsoil. Conover soils are in the slightly lower areas. Peotone soils are in depressional areas or potholes.

Typical pedon of Montmorenci silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 2,050 feet west and 200 feet north of the southeast corner of sec. 32, T. 26 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with dark yellowish brown (10YR 4/4) clay loam from the subsoil; weak fine subangular blocky structure parting to weak fine granular; friable; common very fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous very dark grayish brown (10YR 3/2) organic flows and clay films on faces of peds; about 2 percent gravel; common very dark grayish brown (10YR 3/2) root and worm channels; slightly acid; clear wavy boundary.

Bt2—12 to 17 inches; yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic flows on faces of peds; about 2 percent gravel; common very dark grayish brown (10YR 3/2) root and worm channels; neutral; clear wavy boundary.

Bt3—17 to 27 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct yellowish brown (10YR 5/8) and common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) organic flows on faces of peds; about 4 percent gravel; common very dark grayish brown (10YR 3/2) root and worm channels; neutral; clear wavy boundary.

BC—27 to 32 inches; brown (10YR 5/3) loam; many medium distinct yellowish brown (10YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; thin discontinuous light brownish gray (2.5Y 6/2) clay films on faces of peds; about 4 percent gravel; common very dark grayish brown (10YR 3/2) root and worm channels; slight effervescence; mildly alkaline; gradual wavy boundary.

C—32 to 60 inches; brown (10YR 5/3) loam; common fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly loam or clay loam, but in some pedons it is silty clay loam in the upper part. It is medium acid to neutral. The C horizon has value of 5 or 6 and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Odell Series

The Odell series consists of somewhat poorly drained soils on ground moraines and end moraines. These soils formed in silty deposits and the underlying glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. Slopes range from 0 to 4 percent.

Odell soils are similar to Conover, Gilboa, and Lisbon soils and are adjacent to Chalmers, Corwin, and Wolcott soils. Conover soils have a dark surface layer that is thinner than that of the Odell soils. Gilboa soils have more sand in the upper part of the subsoil than the Odell soils. Lisbon soils have less sand in the subsoil than the Odell soils. The poorly drained Chalmers and very poorly drained Wolcott soils are in depressional areas. They are grayish throughout. Chalmers soils have less sand in the solum than the Odell soils. Corwin soils are browner in the upper part of the subsoil than the Odell soils. They are in the higher areas.

Typical pedon of Odell silt loam, 0 to 2 percent slopes, in a cultivated field; 1,360 feet east and 160 feet south of the northwest corner of sec. 11, T. 24 N., R. 9 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak fine granular; friable; common fine roots; medium acid; abrupt smooth boundary.

BA—10 to 15 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; common fine roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; many very dark gray (10YR 3/1) stains in old root channels; slightly acid; clear wavy boundary.

2Bt1—15 to 24 inches; dark brown (10YR 4/3) clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent gravel; few very dark gray (10YR 3/1) organic stains in old root channels and on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; neutral; clear wavy boundary.

2Bt2—24 to 30 inches; dark brown (10YR 4/3) clay loam; many medium distinct yellowish brown (10YR 5/8) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; few very dark gray (10YR 3/1) organic stains in old root channels and on faces of peds; few black (10YR 2/1) accumulations of iron and manganese oxide; neutral; clear wavy boundary.

2C1—30 to 42 inches; light olive brown (2.5Y 5/4) loam; few medium distinct brownish yellow (10YR 6/6) mottles; massive; firm; about 3 percent gravel; common light gray (10YR 7/1) accumulations of calcium carbonate; few red (2.5YR 5/8) accumulations of iron; strong effervescence; mildly alkaline; gradual wavy boundary.

2C2—42 to 60 inches; light olive brown (2.5Y 5/4) loam; few fine distinct brownish yellow (10YR 6/6) mottles; massive; firm; about 3 percent gravel; few red (2.5YR 5/8) accumulations of iron; many light gray (10YR 7/1) accumulations of calcium carbonate; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or loam. The 2Bt horizon has value of 4 to 6 and chroma of 3 or 4. It is dominantly loam or clay loam, but in some pedons it is silty clay loam in the upper part. It is medium acid to neutral. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Peotone Series

The Peotone series consists of very poorly drained, moderately slowly permeable soils in potholes on end moraines and ground moraines. These soils formed in sediments derived from the adjacent areas. Slopes range from 0 to 2 percent.

Peotone soils are similar to Ashkum, Bryce, and Warners Variant soils and are adjacent to Montmorenci soils. Ashkum, Bryce, and Warners Variant soils have a dark surface soil that is less than 24 inches thick. Ashkum and Bryce soils have more clay in the lower part of the solum and in the underlying material than the Peotone soils. Warners Variant soils have marl within a depth of 32 inches. Montmorenci soils have a dark surface layer that is less than 10 inches thick, have less clay in the subsoil than the Peotone soils, and are browner in the solum. They are in the higher areas.

Typical pedon of Peotone silty clay loam, undrained, in a cultivated field; 220 feet west and 1,860 feet south of the northeast corner of sec. 10, T. 25 N., R. 8 W.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—12 to 27 inches; black (10YR 2/1) silty clay loam; very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; firm; neutral; clear wavy boundary.

Bg1—27 to 33 inches; dark gray (10YR 4/1) silty clay loam; moderate fine subangular blocky structure; firm; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

Bg2—33 to 36 inches; gray (10YR 5/1) silty clay loam; few fine faint light gray (10YR 6/1) and common medium distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; common very dark gray (10YR 3/1) krotovinas; neutral; gradual wavy boundary.

BCg—36 to 45 inches; light gray (10YR 6/1) silty clay loam; few fine faint gray (10YR 5/1) and common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; common very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; gradual irregular boundary.

Cg1—45 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium faint light olive brown (2.5Y 5/4) mottles; massive; firm; common very dark gray (10YR 3/1) krotovinas; strong effervescence; mildly alkaline; gradual wavy boundary.

Cg2—55 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium faint grayish brown (2.5Y 5/2) mottles; massive; firm; common very dark gray (10YR 3/1) krotovinas; strong effervescence; moderately alkaline.

The solum is 38 to 60 inches thick. The mollic epipedon is 24 to 36 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or it is neutral in hue and has value of 2 or 3. Some pedons have a BA horizon. This horizon has the same range of colors as the A horizon. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral in hue and has value of 4 to 6. It is silty clay loam or silty clay. It is slightly acid to mildly alkaline. The BCg and Cg horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1, or they are neutral in hue and have value of 5 or 6. They are silt loam or silty clay loam. The BCg horizon is neutral or mildly alkaline. The Cg horizon is neutral to moderately alkaline.

Rush Series

The Rush series consists of well drained soils on terraces. These soils formed in silty deposits and the underlying outwash deposits. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Rush soils are similar to Tippecanoe and Wea soils and are adjacent to Comfrey and Crane soils. Tippecanoe and Wea soils have a dark surface layer that is thicker than that of the Rush soils and have more sand in the upper part of the solum. Comfrey and Crane soils are more grayish in the upper part of the solum than the Rush soils. Comfrey soils are on flood plains. Crane soils are in the lower areas.

Typical pedon of Rush silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,100 feet south and 2,500 feet east of the northwest corner of sec. 14, T. 24 N., R. 7 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; mixed with yellowish brown (10YR 5/6) silty clay loam from the subsoil; weak fine subangular blocky structure parting to weak medium granular; friable; common fine and medium roots; strongly acid; abrupt smooth boundary.

Bt1—8 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine subangular blocky structure; friable; common very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few very dark grayish brown (10YR 3/2) worm casts and root channels; strongly acid; clear wavy boundary.

Bt2—22 to 31 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; medium continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few yellowish red (5YR 5/8) accumulations of iron; light gray (10YR 6/1) silt coatings along root channels; very strongly acid; clear wavy boundary.

2Bt3—31 to 35 inches; yellowish brown (10YR 5/6) loam; few fine distinct brown (10YR 5/3) and few fine prominent yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; friable; medium continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 5 percent gravel; very strongly acid; clear wavy boundary.

2Bt4—35 to 44 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 5 percent gravel; very strongly acid; clear wavy boundary.

3Bt5—44 to 60 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; common medium faint strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; about 22 percent gravel; common yellowish red (5YR 5/8) accumulations of iron; strongly acid; clear wavy boundary.

3BC—60 to 65 inches; yellowish brown (10YR 5/4) gravelly loamy sand; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; about 22 percent gravel; neutral; gradual irregular boundary.

3C—65 to 80 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand; many medium distinct strong brown (7.5YR 4/6) mottles; single grain; loose; about 17 percent gravel; slight effervescence; mildly alkaline.

The solum is 45 to 70 inches thick. The silty deposits are 24 to 40 inches thick.

The A horizon has value of 4 or 5 and chroma of 2 or 3. The Bt and 2Bt horizons are very strongly acid to medium acid. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt and 3Bt horizons have hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. The 2Bt horizon is clay loam, sandy clay loam, or loam. The 3Bt horizon ranges from strongly acid to neutral. It is gravelly sandy clay loam, gravelly loam, or gravelly clay loam. The content of gravel in this horizon ranges from 15 to 30 percent. The 3C horizon has value of 4 or 5 and chroma of 3 or 4. It is mildly alkaline or moderately alkaline. It is the gravelly or very gravelly analogs of sand, coarse sand, or loamy coarse sand. The content of gravel in this horizon ranges from 15 to 50 percent.

Seafield Series

The Seafield series consists of somewhat poorly drained soils on ground moraines. These soils formed in outwash deposits. Permeability is moderately rapid in the solum and very rapid in the underlying material. Slopes range from 0 to 2 percent.

These soils have more clay in the subsoil than is definitive for the Seafield series. This difference, however, does not alter the usefulness or behavior of the soils.

Seafield soils are similar to Whitaker soils and are adjacent to Ayr Variant, Billett, and Brems Variant soils. Whitaker soils have a surface layer that is lighter colored than that of the Seafield soils and have more clay in the solum. Ayr Variant, Billett, and Brems Variant soils are browner in the solum than the Seafield soils. They are on the higher rises.

Typical pedon of Seafield fine sandy loam, in a cultivated field; 2,040 feet south and 60 feet west of the northeast corner of sec. 16, T. 26 N., R. 6 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak fine granular; friable; few medium and fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 17 inches; yellowish brown (10YR 5/4) fine sandy loam; few fine faint yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few medium and fine roots; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; few very dark grayish brown (10YR 3/2) krotovinas; very strongly acid; clear wavy boundary.

Bt2—17 to 23 inches; yellowish brown (10YR 5/4) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) and common medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—23 to 32 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8), common medium distinct pale brown (10YR 6/3), and many medium faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; common yellowish red (5YR 5/8) accumulations of iron; very strongly acid; clear wavy boundary.

Bt4—32 to 43 inches; light brownish gray (10YR 6/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; common yellowish red (5YR 5/8) accumulations of iron; common black (10YR 2/1) iron and manganese accumulations; streaks of white (10YR 8/1) uncoated sand grains; strongly acid; clear wavy boundary.

C1—43 to 52 inches; light gray (10YR 7/1) fine sand; many medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; single grain; loose; streaks of white (10YR 8/1) uncoated sand grains; slightly acid; gradual wavy boundary.

C2—52 to 60 inches; pale brown (10YR 6/3) fine sand; many medium distinct yellowish brown (10YR 5/6) and common medium distinct gray (10YR 6/1) and brownish yellow (10YR 6/8) mottles; single grain; loose; few black (10YR 2/1) iron and manganese accumulations; neutral.

The solum is 24 to 45 inches thick. The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has value of 5 or 6 and chroma of 2 or 4. It is sandy clay loam, sandy loam, or fine sandy loam. It is very strongly acid to medium acid. The C horizon has value of 5 to 7 and chroma of 1 to 3. It is fine sand, sand, loamy sand, or loamy fine sand. It is medium acid to neutral.

Selma Series

The Selma series consists of poorly drained soils on outwash plains in areas of end moraines and ground moraines. These soils formed in silty sediments over outwash deposits. Permeability is moderate in the solum. It is moderately slow in the underlying material of the till substratum phase and is moderately slow or slow in the underlying material of the moderately fine substratum phase. Slopes range from 0 to 2 percent.

Selma soils are similar to Chalmers, Free, and Wolcott soils and are adjacent to Darroch, Gilboa, and Whitaker soils. Chalmers soils have less sand in the solum than the Selma soils. Free soils have more gravel in the lower part of the solum and in the underlying material than the Selma soils. Wolcott soils have less sand and more clay in the upper part of the underlying material than the Selma soils. Darroch, Gilboa, and Whitaker soils are on the higher knolls and flats. They are browner in the subsoil than the Selma soils. Also, Whitaker soils have a thinner dark surface soil.

Typical pedon of Selma silty clay loam, till substratum, in a cultivated field; 100 feet east and 475 feet south of the northwest corner of sec. 34, T. 26 N., R. 8 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to weak medium granular; friable; common very fine roots; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure parting to weak medium granular; friable; common very fine roots; neutral; clear wavy boundary.

Bg1—12 to 20 inches; gray (10YR 5/1) silty clay loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate very fine subangular blocky structure; friable; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films in pores; common very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

Bg2—20 to 24 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; few very fine roots; thin discontinuous grayish brown (10YR 5/2) clay films in pores; common very dark gray (10YR 3/1) krotovinas; neutral; gradual wavy boundary.

Bg3—24 to 42 inches; grayish brown (10YR 5/2) loam; common medium faint light brownish gray (10YR 6/2), common fine distinct strong brown (7.5YR 5/8), and many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin patchy grayish brown (10YR 5/2) clay films in pores; about 2 percent gravel; few very dark gray (10YR 3/1) krotovinas; neutral; clear wavy boundary.

C1—42 to 50 inches; yellowish brown (10YR 5/4) stratified sand, loamy sand, loam, and silt loam; many medium faint brown (10YR 5/3) and many medium distinct grayish brown (10YR 5/2) mottles; single grain sand and loamy sand and massive loam and silt loam; loose sand and loamy sand and friable loam and silt loam; about 5 percent gravel; few black (N 2/0) accumulations of iron and manganese oxide; few very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; abrupt irregular boundary.

2C2—50 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; firm; about 5 percent gravel; few yellowish red (5YR 5/8) accumulations of iron; slight effervescence; moderately alkaline.

The solum is 35 to 55 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is dominantly loam, clay loam, or silty clay loam, but in some pedons it is sandy clay loam in the lower part. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 6. It is neutral to moderately alkaline. It is stratified sand to silt loam in the upper part. The content of gravel in this horizon ranges from 0 to 15 percent. A moderately fine substratum phase is mapped in the county.

Swygert Series

The Swygert series consists of somewhat poorly drained soils on end moraines. These soils formed in water-sorted deposits over glacial till. Permeability is slow in the upper part of the solum and very slow in the lower part and in the underlying material. Slopes range from 0 to 6 percent.

Swygert soils are similar to Andres and Elliott soils and are adjacent to Bryce soils. Andres and Elliott soils have less clay in the subsoil than the Swygert soils. Bryce soils are grayer in the solum than the Swygert soils. They are poorly drained and are in depressional areas.

Typical pedon of Swygert silty clay loam, 0 to 2 percent slopes, in a cultivated field; 100 feet east and 135 feet south of the northwest corner of sec. 25, T. 26 N., R. 10 W.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; many fine and very fine roots; slightly acid; abrupt wavy boundary.

Bt1—12 to 18 inches; brown (10YR 5/3) silty clay; many fine distinct light brownish gray (2.5Y 6/2) and many fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; many fine and very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; many very dark grayish brown (10YR 3/2) root and earthworm channels and krotovinas; slightly acid; clear wavy boundary.

Bt2—18 to 27 inches; brown (10YR 4/3) silty clay; many fine distinct light brownish gray (2.5Y 6/2) and many medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; many very dark grayish brown (10YR 3/2) root and earthworm channels and krotovinas; neutral; clear wavy boundary.

Bt3—27 to 37 inches; grayish brown (10YR 5/2) silty clay; many medium distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/4) mottles; strong medium angular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; few very fine roots; many very dark grayish brown (10YR 3/2) earthworm channels; common very dark grayish brown (10YR 3/2) root channels and krotovinas; common white (10YR 8/1) accumulations of carbonate; about 2 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

2Bt4—37 to 44 inches; gray (10YR 6/1) silty clay; many medium distinct light yellowish brown (2.5Y 6/4) and olive yellow (2.5Y 6/6) mottles; moderate medium angular blocky structure; very firm; thin patchy gray (10YR 5/1) clay films on faces of peds; few very fine roots; few very dark grayish brown (10YR 3/2) earthworm channels and krotovinas; common white (10YR 8/1) accumulations of carbonate; about 2 percent gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

2C—44 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct gray (10YR 6/1) mottles; massive; very firm; few dark grayish brown (10YR 4/2) krotovinas; common white (10YR 8/1) accumulations of carbonate; about 2 percent gravel; strong effervescence; moderately alkaline.

The solum is 35 to 50 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR, 2.5Y, or

5Y, value of 4 or 5, and chroma of 2 to 6. The 2Bt and 2C horizons are mildly alkaline or moderately alkaline. The 2Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4. It is silty clay loam or silty clay.

Tippecanoe Series

The Tippecanoe series consists of moderately well drained soils on outwash plains and terraces. These soils formed in silty deposits over glacial outwash. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 4 percent.

Tippecanoe soils are similar to Barce, Foresman, Rush, and Wea soils and are adjacent to Comfrey soils. Barce soils have less sand and gravel in the lower part of the solum than the Tippecanoe soils. Foresman soils have a solum that is thinner than that of the Tippecanoe soils and have less gravel in the subsoil and underlying material. Rush soils have a surface layer that is lighter colored than that of the Tippecanoe soils and have less sand in the upper part of the solum. Wea soils are browner in the lower part of the solum than the Tippecanoe soils. Comfrey soils are grayer in the solum than the Tippecanoe soils. They are very poorly drained and are in depressional areas on flood plains.

Typical pedon of Tippecanoe silt loam, 0 to 2 percent slopes, in a cultivated field; 790 feet east and 400 feet south of the northwest corner of sec. 12, T. 25 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure parting to moderate medium granular; friable; common very fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

A—8 to 11 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; common very fine roots; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt1—11 to 14 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; common very fine roots; thin continuous dark brown (10YR 3/3) organic coatings and clay films on faces of peds and in pores; about 1 percent gravel; many very dark grayish brown (10YR 3/2) worm casts and linings in worm channels; medium acid; clear wavy boundary.

2Bt2—14 to 30 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; about 4 percent gravel; common very dark grayish brown (10YR 3/2) worm casts and linings in worm channels; medium acid; clear wavy boundary.

3Bt3—30 to 39 inches; yellowish brown (10YR 5/6) gravelly sandy clay loam; few medium distinct light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 18 percent gravel; few dark brown (7.5YR 3/2) accumulations of iron and manganese oxide; few very dark grayish brown (10YR 3/2) worm casts and linings in worm channels; medium acid; clear wavy boundary.

3Bt4—39 to 51 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; many medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very friable; few very fine roots; thin patchy dark brown (7.5YR 4/4) clay bridges between sand grains; about 30 percent gravel; common dark brown (7.5YR 3/2) accumulations of iron and manganese oxide; a layer of dark brown (7.5YR 4/4) gravelly sandy clay loam at the base of the horizon; slightly acid; clear wavy boundary.

4BC—51 to 60 inches; dark yellowish brown (10YR 4/4) gravelly loamy coarse sand; common fine distinct strong brown (7.5YR 5/8) and common medium distinct grayish brown (10YR 5/2) mottles; massive; very friable; thin patchy dark brown (7.5YR 4/4) clay bridges between sand grains; about 20 percent gravel; mildly alkaline; clear wavy boundary.

4C—60 to 70 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 40 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The depth to gravelly material is 24 to 40 inches. The content of gravel ranges from 0 to 10 percent in the 2Bt horizon, from 15 to 30 percent in the 3Bt horizon, and from 15 to 50 percent in the 4C horizon.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is silt loam or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is strongly acid to slightly acid. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam or loam. The 3Bt horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 3 to 8. It is gravelly sandy loam or gravelly sandy clay loam. It is medium acid to neutral. The 4C horizon has value of 4 to 6 and chroma of 3 or 4. It is gravelly coarse sand or very gravelly coarse sand. It is mildly alkaline or moderately alkaline.

Varna Series

The Varna series consists of moderately well drained soils on ground moraines and end moraines. These soils formed in glacial till. Permeability is moderately slow or slow. Slopes range from 1 to 5 percent.

Varna soils are similar to Corwin and Markham soils and are adjacent to Elliott soils. Corwin soils have less clay in the subsoil than the Varna soils. Markham soils have a surface layer that is thinner than that of the Varna soils. Elliott soils are grayer in the upper part of the solum than the Varna soils. They are in the lower areas.

Typical pedon of Varna silt loam, 1 to 5 percent slopes, eroded, in a cultivated field; 500 feet east and 1,140 feet north of the southwest corner of sec. 14, T. 26 N., R. 8 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with brown (10YR 4/3) silty clay loam from the subsoil; moderate medium subangular blocky structure parting to moderate medium granular; friable; few very fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 14 inches; brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; friable; few very fine roots; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 3 percent gravel; common very dark grayish brown (10YR 3/2) root channels and worm casts; medium acid; clear wavy boundary.

Bt2—14 to 22 inches; yellowish brown (10YR 5/4) silty clay; moderate very fine angular blocky structure; firm; thin continuous brown (10YR 5/3) clay films on faces of peds; about 3 percent gravel; few very dark grayish brown (10YR 3/2) root channels and worm casts; medium acid; clear wavy boundary.

Bt3—22 to 29 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate fine prismatic structure parting to moderate medium angular blocky; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; about 5 percent gravel; few very dark grayish brown (10YR 3/2) root channels; neutral; gradual wavy boundary.

Bt4—29 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; about 5 percent gravel; few light gray (10YR 7/1) accumulations of carbonate; few yellowish red (5YR 5/8) accumulations of iron; slight effervescence; mildly alkaline; clear wavy boundary.

C—32 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam; common medium distinct gray (10YR 6/1) and common medium faint brownish yellow (10YR 6/6) mottles; massive; firm; about 5 percent gravel; common light gray (10YR 7/1) accumulations of carbonate; few yellowish red (5YR 5/8) accumulations of iron; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. It has chroma of 3 or 4 in the upper part and chroma of 2 to 4 in the lower part. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Wallkill Variant

The Wallkill Variant consists of very poorly drained soils in potholes on ground moraines. These soils formed in sediments derived from the adjacent slopes and are underlain by organic deposits. Permeability is slow or moderately slow in the mineral layers and moderately slow to moderately rapid in the organic layers. Slopes range from 0 to 2 percent.

Wallkill Variant soils are similar to Houghton soils and are adjacent to Gilboa and Warners Variant soils. Houghton soils formed in organic deposits that are more than 51 inches thick. Warners Variant and Gilboa soils formed in mineral material and are not underlain by organic material. They are in the higher areas.

Typical pedon of Wallkill Variant silty clay loam, in a cultivated field; 1,000 feet east and 2,200 feet north of the southwest corner of sec. 16, T. 25 N., R. 8 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common very fine roots; medium acid; abrupt wavy boundary.

A1—8 to 22 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; common very fine roots; thin lenses of grayish brown (10YR 5/2) very fine sand; medium acid; clear wavy boundary.

A2—22 to 30 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; few fine distinct yellowish brown (10YR 5/4) mottles; strong medium subangular blocky structure; firm; few very fine roots; thin lenses of grayish brown (10YR 5/2) very fine sand; medium acid; abrupt wavy boundary.

Oa1—30 to 44 inches; sapric material, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 44 percent fiber, 2 percent rubbed; moderate medium platy structure; friable; mostly herbaceous fiber; about 3 percent mineral material; slightly acid; gradual wavy boundary.

Oa2—44 to 60 inches; sapric material, dark brown (7.5YR 3/2) broken face, very dark brown (10YR

2/2) rubbed; about 42 percent fiber, 4 percent rubbed; weak medium platy structure; friable; mostly herbaceous fiber; about 2 percent mineral material; neutral.

The mineral material is 16 to 40 inches deep over the organic material. The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It ranges from strongly acid to neutral. The Oa horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. It is medium acid to neutral. Thin layers of hemic material are in the lower part of some pedons. The content of fiber in the organic material is less than 10 percent after rubbing.

Warners Variant

The Warners Variant consists of very poorly drained soils on ground moraines. These soils formed in lacustrine sediments. Permeability is moderately slow or slow in the solum and in the upper part of the underlying material, moderately rapid or rapid in the middle part of the underlying material, and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Warners Variant soils are similar to Bryce and Peotone soils and are adjacent to Wallkill Variant soils. Bryce, Peotone, and Wallkill Variant soils do not have marl in the underlying material. Bryce and Peotone soils have more clay in the underlying material than the Warners Variant soils. Peotone soils have a dark surface layer that is more than 24 inches thick. Wallkill Variant soils formed in mineral sediments over organic deposits. They are in depressional areas.

Typical pedon of Warners Variant silty clay, undrained, in a cultivated field; 130 feet north and 850 feet west of the southeast corner of sec. 8, T. 25 N., R. 6 W.

Ap—0 to 12 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; weak coarse subangular blocky structure; friable; few fine roots; slightly acid; clear irregular boundary.

Bg—12 to 23 inches; dark gray (5Y 4/1) silty clay; common medium distinct light olive brown (2.5Y 5/6) and many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few very fine roots; many black (10YR 2/1) krotovinas and root channels; neutral; clear wavy boundary.

Cg1—23 to 36 inches; gray (5Y 5/1) marl; many medium distinct olive (5Y 5/3) mottles; massive; friable; many very dark gray (10YR 3/1) root channels; many white (10YR 8/1) shell fragments; violent effervescence; moderately alkaline; abrupt wavy boundary.

Cg2—36 to 49 inches; olive gray (5Y 4/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; common white (N 8/0) accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Cg3—49 to 55 inches; olive gray (5Y 5/2) gravelly fine sandy loam; common medium faint gray (5Y 5/1) mottles; massive; friable; about 25 percent gravel; strong effervescence; mildly alkaline; gradual wavy boundary.

2Cg4—55 to 60 inches; gray (N 6/0) loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; about 7 percent gravel; strong effervescence; mildly alkaline.

The upper mineral material is 20 to 32 inches deep over marl. The marl ranges from 2 to 40 inches in thickness. The lacustrine and outwash material ranges from 9 to 30 inches in thickness. It is underlain by glacial till.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral in hue and has value of 2 or 3. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2, or it is neutral in hue and has value of 3 to 5. The Cg and 2Cg horizons are mildly alkaline or moderately alkaline. The Cg1 horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2, or it is neutral in hue and has value of 5 to 7. The Cg2, Cg3, and 2Cg4 horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6, or they are neutral in hue and have value of 4 to 6. The content of gravel in the Cg3 horizon ranges from 5 to 35 percent.

Wea Series

The Wea series consists of well drained soils on outwash plains and terraces. These soils formed in outwash deposits. Permeability is moderate in the solum and very rapid in the underlying material. Slopes range from 0 to 6 percent.

Wea soils are similar to Rush and Tippecanoe soils and are adjacent to Comfrey, Crane, and Free soils. Rush soils have a surface layer that is lighter colored than that of the Wea soils and have less sand in the upper part of the solum. Tippecanoe soils are grayer in the lower part of the solum than the Wea soils. Comfrey, Crane, and Free soils are grayer throughout the solum than the Wea soils. Comfrey soils are on flood plains. Crane soils are on the lower flats. Free soils are very poorly drained and are in depressional areas.

Typical pedon of Wea silt loam, 0 to 2 percent slopes, in a cultivated field; 2,580 feet east and 80 feet north of the southwest corner of sec. 32, T. 26 N., R. 9 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; common fine and very fine roots; neutral; abrupt smooth boundary.

AB—10 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine and very fine roots; neutral; abrupt wavy boundary.

Bt1—17 to 27 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; friable; common very fine roots; medium discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 6 percent gravel; medium acid; clear wavy boundary.

2Bt2—27 to 43 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; friable; medium discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 20 percent gravel and 5 percent cobblestones; strongly acid; clear wavy boundary.

2Bt3—43 to 52 inches; brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; clay bridges between sand grains; about 16 percent gravel; medium acid; clear wavy boundary.

2Bt4—52 to 60 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; medium discontinuous dark brown (10YR 4/3) clay films on faces of peds; about 20 percent gravel and 5 percent cobblestones; slightly acid; abrupt wavy boundary.

3C—60 to 70 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand; few fine distinct dark grayish brown (10YR 4/2) mottles; single grain; loose; about 20 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The depth to gravelly material is 24 to 40 inches. The content of gravel ranges from 0 to 10 percent in the Bt horizon, from 15 to 35 percent in the 2Bt horizon, and from 15 to 50 percent in the 3C horizon.

The A horizon has value and chroma of 2 or 3. It is silt loam or loam. The Bt horizon has hue of 7.5YR or 10YR and value of 4 or 5. It is dominantly clay loam or loam, but in some pedons it is silt loam or silty clay loam in the upper part. It is strongly acid to slightly acid. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly sandy clay loam, gravelly loam, or gravelly sandy loam. It ranges from strongly acid to neutral. The 3C horizon has value of 4 to 6 and chroma of 3 or 4. It is gravelly coarse sand, gravelly loamy coarse sand, or very gravelly coarse sand. It is mildly alkaline or moderately alkaline.

Whitaker Series

The Whitaker series consists of somewhat poorly drained soils on outwash plains in areas of ground moraines. These soils formed in silty sediments and outwash deposits. Permeability is moderate in the solum and moderate or moderately rapid in the underlying material. Slopes range from 0 to 3 percent.

Whitaker soils are similar to Conover, Darroch, and Seafield soils and are adjacent to Selma soils. Conover, Darroch, Seafield, and Selma soils have a surface layer that is darker than that of the Whitaker soils. Also, Conover soils have more clay in the underlying material, and Seafield soils have less clay in the solum. Selma soils are grayer in the upper part of the subsoil than the Whitaker soils. They are poorly drained and are in depressional areas.

Typical pedon of Whitaker silt loam, 0 to 3 percent slopes, in a cultivated field; 380 feet north and 1,400 feet west of the southeast corner of sec. 19, T. 25 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; few medium and fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 16 inches; brown (10YR 5/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; few medium and fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and along root channels; common very dark gray (10YR 3/1) organic stains on faces of peds and along root channels; common very dark grayish brown (10YR 3/2) krotovinas; medium acid; clear wavy boundary.

2Bt2—16 to 26 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; common very dark gray (10YR 3/1) organic stains on faces of peds; strongly acid; clear wavy boundary.

2Bt3—26 to 33 inches; brownish yellow (10YR 6/6) loam; common medium distinct yellowish brown (10YR 5/8) and few fine distinct gray (10YR 6/1) mottles; moderate medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; common very dark gray (10YR 3/1) organic stains on faces of peds; medium acid; clear wavy boundary.

2BC—33 to 41 inches; light olive brown (2.5Y 5/4) loam; common medium prominent strong brown (7.5YR

5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thin lenses of sandy loam, fine sandy loam, very fine sandy loam, and silt loam; common white (10YR 8/1) accumulations of carbonate; slight effervescence; mildly alkaline; clear smooth boundary.

2C1—41 to 55 inches; light olive brown (2.5Y 5/4) loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; friable; thin lenses of loamy sand and silt loam; few white (10YR 8/1) accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

2C2—55 to 60 inches; light olive brown (2.5Y 5/4) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; friable; thin lenses of sand and coarse sand; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The A horizon has value of 4 to 6 and chroma of 2 or 3. It is silt loam, loam, or fine sandy loam. The Bt and 2Bt horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. The Bt horizon is strongly acid or medium acid. The 2Bt horizon is clay loam, sandy clay loam, or loam. It is strongly acid or medium acid in the upper part and medium acid to neutral in the lower part. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is dominantly sandy loam, fine sandy loam, very fine sandy loam, loam, or silt loam but has thin strata of sand, loamy sand, or coarse sand. It is mildly alkaline or moderately alkaline.

Wolcott Series

The Wolcott series consists of very poorly drained, moderately permeable soils on ground moraines. These soils formed in glacial till. Slopes range from 0 to 2 percent.

Wolcott soils are similar to Ashkum, Chalmers, and Selma soils and are adjacent to Corwin and Odell soils. Ashkum soils have more clay in the solum than the Wolcott soils. Chalmers soils have less sand in the solum than the Wolcott soils. Selma soils have more sand and less clay in the upper part of the underlying material than the Wolcott soils. Corwin and Odell soils are browner in the solum than the Wolcott soils. They are in the higher areas.

Typical pedon of Wolcott loam, in a cultivated field; 1,800 feet east and 45 feet south of the northwest corner of sec. 5, T. 26 N., R. 6 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; about 1 percent gravel; many fine roots; neutral; abrupt smooth boundary.

AB—9 to 14 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; few fine distinct brown (10YR 4/3) mottles; moderate medium granular structure; friable; many fine roots; about 2 percent gravel; neutral; clear wavy boundary.

Bg1—14 to 25 inches; dark gray (10YR 4/1) loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; common fine and very fine roots; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds; about 2 percent gravel; common very dark grayish brown (10YR 3/2) root channels; neutral; clear wavy boundary.

Bg2—25 to 30 inches; dark grayish brown (10YR 4/2) loam; many medium faint dark gray (10YR 4/1), many medium distinct brown (10YR 5/3), and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine and very fine roots; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds; about 1 percent gravel; common very dark grayish brown (10YR 3/2) root channels; few very dark grayish brown (10YR 3/2) krotovinas; neutral; clear wavy boundary.

Bg3—30 to 37 inches; grayish brown (2.5Y 5/2) loam; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; common fine and very fine roots; about 3 percent gravel; few very dark grayish brown (10YR 3/2) krotovinas; neutral; clear wavy boundary.

BCg—37 to 49 inches; light gray (10YR 6/1) loam; common medium distinct yellowish brown (10YR 5/8) and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; friable; few fine and very fine roots; about 4 percent gravel; few very dark grayish brown (10YR 3/2) krotovinas; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg—49 to 54 inches; light gray (10YR 6/1) loam; common medium distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/4) mottles; massive; firm; about 3 percent gravel; few strong brown (7.5YR 5/8) accumulations of iron; slight effervescence; moderately alkaline; gradual wavy boundary.

C—54 to 60 inches; light olive brown (2.5Y 5/4) loam; common medium distinct yellowish brown (10YR 5/6) and light gray (10YR 6/1) mottles; massive; firm; about 3 percent gravel; few strong brown (7.5YR 5/8) accumulations of iron; strong effervescence; moderately alkaline.

The solum is 30 to 60 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam, loam, or clay loam. 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 or clay loam. It is slightly acid or neutral. The Cg and C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6 or are neutral in hue and have value of 4 to 6. They are mildly alkaline or moderately alkaline.

Formation of the Soils

This section relates the major factors of soil formation to the soils in Benton County. It also describes the processes of soil formation.

Factors of Soil Formation

Soils form through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil formed; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

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 and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also 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. Some time is always required for the differentiation of 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 other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils of Benton County generally were deposited by glaciers or by meltwater from the glaciers. Some of these materials were reworked and redeposited by the subsequent actions of water and wind. The glaciers covered the county about 10,000 to 15,000 years ago. Although most of the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Benton County were deposited as glacial till, outwash, lacustrine material, alluvium, and organic material. The soils formed mainly in Wisconsinan glacial outwash and glacial till. A layer of silty sediments was deposited over the glacial material in most areas. Soils along the streams commonly formed in recent alluvium over sandy material. In a few small areas in the county, mucky soils formed in depressions.

The preglacial landscape in Benton County consisted mainly of shale, sandstone, and siltstone bedrock and, to a small extent, limestone and dolomite. The bedrock under most of the county is Mississippian shale, sandstone, and siltstone. In the central and extreme southern and eastern parts of the county, however, it is Devonian and Mississippian shale, limestone, and domolite. Several glaciers covered the county. The Wisconsinan glacier, the most recent one, had the greatest effect on soil formation. The glacial drift is as much as 260 feet thick.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. Many of the small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Benton County is calcareous, firm or very firm loam, silt loam, clay loam, silty clay loam, and silty clay. Corwin soils are an example of soils that formed in glacial till. These soils typically are silty and loamy and have well developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash varies, depending on the velocity of the water that carried the material. When the water slowed down, the coarser particles were deposited. Finer particles, such as very fine sand, silt, and clay, were carried by the more slowly moving water. Outwash deposits generally occur as layers of similar-size particles. Tippecanoe soils are an example of soils that formed in outwash.

Lacustrine material was deposited from still, or ponded, glacial meltwater. Because the coarser particles dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. The lacustrine deposits in Benton County are silty or clayey. Warners Variant soils are an example of soils that formed in lacustrine material.

Alluvial material was recently deposited by floodwater along present streams. Comfrey soils are an example of soils that formed in alluvium.

Organic material occurs as deposits of plant remains. After the glaciers withdrew from the survey area, water was left standing in depressions. Grasses and sedges growing around the edges of these bodies of water died, and their remains fell to the bottom. These areas were eventually filled with organic material, which developed into peat and then decomposed into muck. In some areas the material has changed little since deposition. Houghton soils formed in organic material.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil and the amount of water available for the weathering of minerals and the translocation of soil material. Through its influence on temperature, climate determines the rate of chemical reaction in the soil. These influences are important, but they affect large areas rather than a relatively small area, such as a county.

The climate in Benton County is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in Benton County differ from soils that formed under a dry, warm climate and from those that formed under a hot, moist climate. Although the climate is uniform throughout the county, its effect is modified locally by runoff. Only minor differences among the soils are the result of differences in climate. More detailed information about the climate is available under the heading "General Nature of the County."

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Benton County. Bacteria, fungi, and earthworms, however, also have been important. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became organic matter. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria in the soil helped to break down the organic matter into plant nutrients.

The native vegetation in Benton County was mainly prairie grasses in the uplands and decidous trees along the major streams, especially in the southern part of the county. The upland soils can be divided into three groups. The well drained and moderately well drained soils, such as Wea and Varna soils, mainly supported little bluestem, flowering spurge, roundhead lespedeza, switchgrass, and wholeleaf rosinweed. The somewhat poorly drained soils, such as Crane and Gilboa soils, mainly supported big bluestem, Canada wildrye, compassplant, stiff goldenrod, and indiangrass. The poorly drained and very poorly drained soils, such as Bryce and Wolcott soils, mainly supported bluejoint reedgrass and prairie cordgrass. All of these soils contain a considerable amount of organic matter, especially the Bryce and Wolcott soils.

Generally, Miami and other well drained soils on slopes adjacent to bottom land supported sugar maple, black cherry, white oak, black oak, and American elm. Soils on the flood plains mainly supported red elm, pin oak, black walnut, silver maple, red maple, American sycamore, white ash, and eastern cottonwood. The soils that formed dominantly under forest vegetation generally have less organic matter than the soils that formed under grasses.

Relief

Relief has markedly affected the soils in Benton County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes generally range from 0 to 20 percent. Runoff is most rapid on the steeper slopes. Water is ponded in the lower areas.

Natural soil drainage in the county ranges from well drained on some ridgetops to very poorly drained in the depressions. Through its effect on soil aeration, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. In Rush and other well drained, well aerated soils, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Wolcott and other very poorly drained, poorly aerated soils are generally dull gray and mottled.

Time

Usually, a long time is required for the processes of soil formation to form distinct soil horizons. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly. Others form slowly.

The soils in Benton County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to the soil-forming processes long enough for distinct horizons to form. Soils that formed in recent alluvium, however, have not been in place long enough for the development of distinct horizons. Comfrey soils are an example of these young soils.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Benton County. These processes are the accumulation of organic matter; the dissolution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most soils more than one of these processes have helped to differentiate horizons.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Drummer and Peotone soils, have a thick, dark surface soil.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of a seasonal high water table or the slow movement of water through the profile.

Silicate clays accumulate in pores and on the faces of the structural units along which water moves. The leaching of bases and the translocation of silicate clays are among the more important processes of horizon differentiation in the county. Foresman soils are an example of soils in which translocated silicate clays in the form of clay films have accumulated in the Bt horizon.

Gleying, or the reduction and transfer of iron, has occurred in most of the very poorly drained to somewhat poorly drained soils in the county. In these naturally wet soils, this process has significantly affected horizon differentiation. A gray color in the subsoil indicates the reduction of iron oxide. The reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower ones or completely out of the profile. Mottles, which are in many horizons, indicate the segregation of iron.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

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 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.

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.

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.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 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.

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.

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, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

End moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of 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.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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.

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, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

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.

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.)

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains 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.

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.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

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 surface layer or of the underlying material. 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.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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.

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.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

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 of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind 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.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material 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.

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.

Underlying material. The part of the soil below the solum.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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 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 sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-72 at Fowler, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	33.0	16.5	24.7	63	-13	0	1.93	0.83	2.85	5	5.6
February----	36.7	19.0	27.9	61	-8	0	1.29	.69	1.81	4	5.6
March-------	46.9	27.6	37.2	79	3	30	2.27	1.15	3.24	6	4.1
April-------	63.5	40.6	52.1	84	22	108	4.35	2.77	5.77	9	1.3
May---------	74.3	50.7	62.6	92	31	400	3.30	1.72	4.68	7	.0
June--------	82.8	59.5	71.2	98	43	636	4.27	1.97	6.24	7	.0
July--------	85.7	63.3	74.5	98	48	760	4.70	2.37	6.73	6	.0
August------	84.2	61.6	72.9	96	46	710	2.87	1.88	3.76	5	.0
September---	78.9	54.8	66.9	95	35	507	3.62	1.05	5.69	5	.0
October-----	64.7	42.5	53.6	85	23	141	3.25	1.48	4.76	6	.0
November----	49.2	31.1	40.2	72	8	12	2.24	1.41	2.99	6	2.9
December----	37.8	22.6	30.2	64	-7	0	2.50	.69	3.94	6	5.0
Yearly:											
Average---	61.5	40.8	51.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-14	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,304	36.59	32.09	43.02	72	24.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-72 at Fowler, Indiana)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 14	Apr. 26	May 15
2 years in 10 later than--	Apr. 10	Apr. 21	May 9
5 years in 10 later than--	Apr. 2	Apr. 12	Apr. 28
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 28	Oct. 17	Oct. 2
2 years in 10 earlier than--	Nov. 1	Oct. 21	Oct. 7
5 years in 10 earlier than--	Nov. 7	Oct. 29	Oct. 18

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-72 at Fowler, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	202	182	149
8 years in 10	208	188	157
5 years in 10	219	199	172
2 years in 10	229	210	188
1 year in 10	235	215	196

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AnA	Andres silt loam, 0 to 2 percent slopes	1,443	0.6
AnB	Andres silt loam, 2 to 4 percent slopes	241	0.1
As	Ashkum silty clay loam	3,068	1.2
AyB2	Ayr Variant fine sandy loam, 2 to 6 percent slopes, eroded	343	0.1
BaB2	Barce loam, 2 to 6 percent slopes, eroded	13,356	5.1
BaC2	Barce loam, 6 to 12 percent slopes, eroded	308	0.1
BbA	Barce silt loam, 0 to 2 percent slopes	2,633	1.0
BdB2	Billett sandy loam, 2 to 6 percent slopes, eroded	1,479	0.6
BeC2	Billett loam, 6 to 12 percent slopes, eroded	277	0.1
BmA	Brems Variant fine sandy loam, 0 to 3 percent slopes	204	0.1
Bt	Bryce silty clay	1,615	0.6
Ch	Chalmers silty clay loam	38,910	15.0
Ck	Comfrey silty clay loam, sandy substratum, occasionally flooded	3,363	1.3
Cm	Comfrey silty clay loam, sandy substratum, frequently flooded	2,085	0.8
CpA	Conover silt loam, 0 to 3 percent slopes	2,011	0.8
CsA	Corwin silt loam, 0 to 2 percent slopes	2,274	0.9
CsB2	Corwin silt loam, 2 to 6 percent slopes, eroded	18,288	7.0
CsC2	Corwin silt loam, 6 to 12 percent slopes, eroded	561	0.2
Ct	Crane silt loam	3,129	1.2
Cu	Crane loam, till substratum	5,151	2.0
Do	Darroch silt loam	3,615	1.4
Dp	Darroch silt loam, till substratum	12,610	4.8
Dr	Darroch silt loam, moderately fine substratum	553	0.2
Du	Drummer silty clay loam	8,483	3.3
Dv	Drummer silty clay loam, gravelly substratum	1,377	0.5
Dx	Drummer silty clay loam, stratified sandy substratum	4,420	1.7
ElA	Elliott silt loam, 0 to 2 percent slopes	1,396	0.5
ElB2	Elliott silt loam, 2 to 4 percent slopes, eroded	1,944	0.7
FoB2	Foresman silt loam, 1 to 5 percent slopes, eroded	2,067	0.8
FpB2	Foresman silt loam, till substratum, 1 to 5 percent slopes, eroded	4,609	1.8
FrB2	Foresman loam, moderately fine substratum, 1 to 5 percent slopes, eroded	236	0.1
Ft	Free clay loam	2,868	1.1
GlA	Gilboa silt loam, 0 to 2 percent slopes	15,018	5.7
GlB	Gilboa silt loam, 2 to 4 percent slopes	4,073	1.6
Ho	Houghton muck	641	0.2
LsA	Lisbon silt loam, 0 to 2 percent slopes	1,652	0.6
MbB2	Markham silt loam, 2 to 6 percent slopes, eroded	1,470	0.6
MlB2	Miami silt loam, 2 to 6 percent slopes, eroded	1,599	0.6
MlD2	Miami silt loam, 12 to 20 percent slopes, eroded	324	0.1
MmC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	1,749	0.7
MuB3	Montmorenci loam, 2 to 6 percent slopes, severely eroded	466	0.2
MxB2	Montmorenci silt loam, 2 to 6 percent slopes, eroded	11,341	4.4
OlA	Odell silt loam, 0 to 2 percent slopes	18,263	7.0
OlB2	Odell silt loam, 2 to 4 percent slopes, eroded	10,816	4.2
Pn	Peotone silty clay loam, undrained	1,331	0.5
Pt	Pits, gravel	22	*
RuA	Rush silt loam, 0 to 2 percent slopes	351	0.1
RuB2	Rush silt loam, 2 to 6 percent slopes, eroded	498	0.2
Sd	Seafield fine sandy loam	225	0.1
Sh	Selma silty clay loam, till substratum	30,454	11.7
Sk	Selma silty clay loam, moderately fine substratum	2,207	0.8
SxA	Swygert silty clay loam, 0 to 2 percent slopes	1,086	0.4
SxB2	Swygert silty clay loam, 2 to 6 percent slopes, eroded	594	0.2
TlA	Tippecanoe silt loam, 0 to 2 percent slopes	1,847	0.7
TlB	Tippecanoe silt loam, 2 to 4 percent slopes	1,341	0.5
VaB2	Varna silt loam, 1 to 5 percent slopes, eroded	1,594	0.6
Wa	Wallkill Variant silty clay loam	713	0.3
Wb	Warners Variant silty clay, undrained	656	0.3
WhA	Wea silt loam, 0 to 2 percent slopes	1,295	0.5
WhB2	Wea silt loam, 2 to 6 percent slopes, eroded	1,016	0.4
WoA	Whitaker silt loam, 0 to 3 percent slopes	488	0.2
Wt	Wolcott loam	2,045	0.8
	Water areas less than 40 acres in size	145	0.1
	Total	260,237	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AnA	Andres silt loam, 0 to 2 percent slopes (where drained)
AnB	Andres silt loam, 2 to 4 percent slopes (where drained)
As	Ashkum silty clay loam (where drained)
AyB2	Ayr Variant fine sandy loam, 2 to 6 percent slopes, eroded
BaB2	Barce loam, 2 to 6 percent slopes, eroded
BbA	Barce silt loam, 0 to 2 percent slopes
BdB2	Billett sandy loam, 2 to 6 percent slopes, eroded
Bt	Bryce silty clay (where drained)
Ch	Chalmers silty clay loam (where drained)
Ck	Comfrey silty clay loam, sandy substratum, occasionally flooded (where drained)
Cm	Comfrey silty clay loam, sandy substratum, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
CpA	Conover silt loam, 0 to 3 percent slopes (where drained)
CsA	Corwin silt loam, 0 to 2 percent slopes
CsB2	Corwin silt loam, 2 to 6 percent slopes, eroded
Ct	Crane silt loam (where drained)
Cu	Crane loam, till substratum (where drained)
Do	Darroch silt loam (where drained)
Dp	Darroch silt loam, till substratum (where drained)
Dr	Darroch silt loam, moderately fine substratum (where drained)
Du	Drummer silty clay loam (where drained)
Dv	Drummer silty clay loam, gravelly substratum (where drained)
Dx	Drummer silty clay loam, stratified sandy substratum (where drained)
ElA	Elliott silt loam, 0 to 2 percent slopes (where drained)
ElB2	Elliott silt loam, 2 to 4 percent slopes, eroded (where drained)
FoB2	Foresman silt loam, 1 to 5 percent slopes, eroded
FpB2	Foresman silt loam, till substratum, 1 to 5 percent slopes, eroded
FrB2	Foresman loam, moderately fine substratum, 1 to 5 percent slopes, eroded
Ft	Free clay loam (where drained)
GlA	Gilboa silt loam, 0 to 2 percent slopes (where drained)
GlB	Gilboa silt loam, 2 to 4 percent slopes (where drained)
LsA	Lisbon silt loam, 0 to 2 percent slopes (where drained)
MbB2	Markham silt loam, 2 to 6 percent slopes, eroded
MlB2	Miami silt loam, 2 to 6 percent slopes, eroded
MxB2	Montmorenci silt loam, 2 to 6 percent slopes, eroded
OlA	Odell silt loam, 0 to 2 percent slopes (where drained)
OlB2	Odell silt loam, 2 to 4 percent slopes, eroded (where drained)
RuA	Rush silt loam, 0 to 2 percent slopes
RuB2	Rush silt loam, 2 to 6 percent slopes, eroded
Sd	Seafield fine sandy loam (where drained)
Sh	Selma silty clay loam, till substratum (where drained)
Sk	Selma silty clay loam, moderately fine substratum (where drained)
SxA	Swygert silty clay loam, 0 to 2 percent slopes (where drained)
SxB2	Swygert silty clay loam, 2 to 6 percent slopes, eroded (where drained)
TlA	Tippecanoe silt loam, 0 to 2 percent slopes
TlB	Tippecanoe silt loam, 2 to 4 percent slopes
VaB2	Varna silt loam, 1 to 5 percent slopes, eroded
Wa	Wallkill Variant silty clay loam (where drained)
WhA	Wea silt loam, 0 to 2 percent slopes
WhB2	Wea silt loam, 2 to 6 percent slopes, eroded
WoA	Whitaker silt loam, 0 to 3 percent slopes (where drained)
Wt	Wolcott loam (where drained)

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
AnA: Andres	IIw	145	51	65	4.8	9.6
AnB: Andres	IIe	141	48	63	4.6	9.2
As: Ashkum	IIw	130	47	54	4.3	8.6
AyB2: Ayr Variant	IIe	100	35	40	3.3	6.6
BaB2: Barce	IIe	120	42	48	4.4	8.8
BaC2: Barce	IIIe	110	38	50	3.9	7.8
BbA: Barce	I	125	44	56	4.5	9.0
BdB2: Billett	IIIe	79	28	36	3.5	7.0
BeC2: Billett	IIIe	85	29	39	3.5	7.0
BmA: Brems Variant	IIIs	75	26	34	2.5	5.0
Bt: Bryce	IIw	120	43	48	4.0	8.0
Ch: Chalmers	IIw	150	53	60	5.0	10.0
Ck: Comfrey	IIIw	120	42	48	3.9	7.8
Cm: Comfrey	Vw	---	---	---	---	---
CpA: Conover	IIw	120	42	54	4.0	8.0
CsA: Corwin	I	120	42	54	4.0	8.0
CsB2: Corwin	IIe	115	40	52	3.8	7.6
CsC2: Corwin	IIIe	95	33	44	3.6	7.2
Ct: Crane	IIw	120	40	48	4.0	8.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Cu----------------------- Crane	IIw	130	45	52	4.3	8.6
Do----------------------- Darroch	IIw	130	46	52	4.3	8.6
Dp----------------------- Darroch	IIw	135	48	54	4.8	9.6
Dr----------------------- Darroch	IIw	140	50	56	4.6	9.2
Du----------------------- Drummer	IIw	154	54	61	5.5	11.0
Dv----------------------- Drummer	IIw	146	51	58	4.8	9.6
Dx----------------------- Drummer	IIw	154	54	61	5.5	11.0
ElA---------------------- Elliott	IIw	120	42	55	4.0	8.0
ElB2--------------------- Elliott	IIe	115	40	52	3.8	7.6
FoB2, FpB2, FrB2---------- Foresman	IIe	125	44	50	4.1	8.2
Ft----------------------- Free	IIw	140	49	56	4.5	9.0
GlA---------------------- Gilboa	IIw	135	47	61	4.8	9.6
GlB---------------------- Gilboa	IIe	135	47	61	4.7	9.4
Ho----------------------- Houghton	IIIw	90	32	---	---	---
LsA---------------------- Lisbon	IIw	135	47	61	4.5	9.0
MbB2--------------------- Markham	IIe	105	36	48	3.5	7.0
MlB2--------------------- Miami	IIe	105	37	47	3.4	6.8
MlD2--------------------- Miami	IVe	80	28	36	2.6	5.2
MmC3--------------------- Miami	IVe	85	30	38	3.0	6.0
MuB3--------------------- Montmorenci	IIIe	105	37	42	3.5	7.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
MxB2 Montmorenci	IIe	110	38	50	3.6	7.2
OlA Odell	IIw	125	44	56	4.1	8.2
OlB2 Odell	IIe	120	42	54	4.1	8.2
Pn Peotone	Vw	---	---	---	---	---
Pt**. Pits						
RuA Rush	I	125	44	50	4.1	8.2
RuB2 Rush	IIe	120	42	48	4.0	8.0
Sd Seafield	IIw	95	33	38	3.1	6.2
Sh, Sk Selma	IIw	150	53	60	5.0	10.0
SxA Swygert	IIw	114	39	51	4.5	9.0
SxB2 Swygert	IIe	110	39	50	4.2	8.4
TlA Tippecanoe	IIs	115	40	46	3.8	7.6
TlB Tippecanoe	IIe	115	40	46	3.8	7.6
VaB2 Varna	IIe	110	40	51	4.7	9.4
Wa Wallkill Variant	IIIw	115	40	46	3.8	7.6
Wb Warners Variant	Vw	---	---	---	---	---
WhA Wea	IIs	115	40	46	4.0	8.0
WhB2 Wea	IIe	110	40	44	3.8	7.6
WoA Whitaker	IIw	125	44	50	4.3	8.6
Wt Wolcott	IIw	150	53	60	5.0	10.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	5,258	---	---	---	---
II	240,655	75,426	162,087	3,142	---
III	8,012	3,091	4,717	204	---
IV	2,073	2,073	---	---	---
V	4,072	---	4,072	---	---
VI	---	---	---	---	---
VII	---	---	---	---	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
BdB2: Billett	3A	Slight	Slight	Slight	Slight	Northern red oak	60	43	Red pine, eastern white pine, white spruce.
						White oak	---	---	
						Black oak	---	---	
						Northern pin oak	---	---	
						Shagbark hickory	---	---	
BeC2: Billett	4A	Slight	Slight	Slight	Slight	Black oak	70	52	Eastern white pine, red pine.
						White oak	70	52	
						Scarlet oak	70	52	
CpA: Conover	4A	Slight	Slight	Slight	Slight	Northern red oak	75	57	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	85	67	
						Yellow-poplar	85	81	
Ho: Houghton	2W	Slight	Severe	Severe	Severe	White ash	51	35	
						Red maple	51	33	
						Black willow	---	---	
						Quaking aspen	56	56	
						Silver maple	76	30	
MbB2: Markham	4A	Slight	Slight	Slight	Slight	White oak	80	62	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine.
						Northern red oak	80	62	
						Yellow-poplar	90	90	
						Black walnut	---	---	
MlB2, MlD2, MmC3: Miami	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar	98	104	
RuA, RuB2: Rush	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
						Northern red oak	90	72	
						Yellow-poplar	98	104	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Sd------------- Seafield	3A	Slight	Slight	Slight	Slight	White oak---------- Pin oak------------ Yellow-poplar------- Northern red oak----	65 80 80 70	48 62 71 52	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore, green ash.
WoA------------ Whitaker	4A	Slight	Slight	Slight	Slight	White oak---------- Pin oak------------ Yellow-poplar------- Northern red oak----	70 85 85 75	52 67 81 57	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
AnA, AnB Andres	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
As Ashkum	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, northern white-cedar, Norway spruce, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
AyB2 Ayr Variant	---	Washington hawthorn, Amur privet, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, eastern redcedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
BaB2, BaC2, BbA Barce	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
BdB2 Billett	Lilac	Russian-olive, Tatarian honeysuckle, eastern redcedar, Siberian peashrub.	Eastern white pine, honeylocust, hackberry, red pine, Norway spruce, green ash, Amur maple.	---	---
BeC2 Billett	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, Norway spruce, red pine.	---
BmA Brems Variant	---	Washington hawthorn, Amur privet, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, eastern redcedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
Bt----------------- Bryce	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Ch----------------- Chalmers	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Ck, Cm------------ Comfrey	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
CpA--------------- Conover	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
CsA, CsB2, CsC2--- Corwin	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Ct----------------- Crane	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Cu----------------- Crane	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
Do, Dp, Dr--------- Darroch	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
Du----------------- Drummer	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Norway spruce, Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine.	Eastern white pine	Pin oak.
Dv----------------- Drummer	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Dx----------------- Drummer	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Norway spruce, Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine.	Eastern white pine	Pin oak.
ElA, ElB2--------- Elliott	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
FoB2, FpB2, FrB2-- Foresman	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Ft----------------- Free	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
GlA, GlB---------- Gilboa	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Ho----------------- Houghton	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
LsA--------------- Lisbon	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
MbB2-------------- Markham	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MlB2, MlD2, MmC3-- Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MuB3, MxB2-------- Montmorenci	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
OlA, OlB2--------- Odell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Pn. Peotone					
Pt*. Pits					
RuA, RuB2--------- Rush	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Sd---------------- Seafield	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
Sh, Sk----------- Selma	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
SxA, SxB2--------- Swygert	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak-----------	---
TlA, TlB---------- Tippecanoe	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
VaB2-------------- Varna	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, arrowwood, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Wa---------------- Wallkill Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Wb---------------- Warners Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
WhA, WhB2--------- Wea	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	>8	8-15	16-25	26-35	35
WoA---------------- Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.
Wt---------------- Wolcott	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AnA, AnB Andres	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
As Ashkum	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
AyB2 Ayr Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
BaB2 Barce	Slight	Slight	Moderate: slope.	Slight	Slight.
BaC2 Barce	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
BbA Barce	Slight	Slight	Slight	Slight	Slight.
BdB2 Billett	Slight	Slight	Moderate: slope.	Slight	Slight.
BeC2 Billett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
BmA Brems Variant	Slight	Slight	Slight	Slight	Slight.
Bt Bryce	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Ch Chalmers	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ck Comfrey	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Cm Comfrey	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
CpA Conover	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CsA Corwin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
CsB2 Corwin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CsC2 Corwin	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Ct, Cu Crane	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Do, Dp, Dr Darroch	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Du, Dv, Dx Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ElA, ElB2 Elliott	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FoB2, FpB2, FrB2 Foresman	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Ft Free	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GlA, GlB Gilboa	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ho Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
LsA Lisbon	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MbB2 Markham	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MlB2 Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MlD2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MmC3 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MuB3, MxB2 Montmorenci	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
OlA, OlB2 Odell	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Pn Peotone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pt*. Pits					
RuA------------------- Rush	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
RuB2------------------ Rush	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Sd-------------------- Seafield	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Sh, Sk---------------- Selma	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
SxA, SxB2------------- Swygert	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Slight.
TlA------------------- Tippecanoe	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
TlB------------------- Tippecanoe	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
VaB2------------------ Varna	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
Wa-------------------- Wallkill Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wb-------------------- Warners Variant	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
WhA------------------- Wea	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
WhB2------------------ Wea	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
WoA------------------- Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Wt-------------------- Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AnA----------------- Andres	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
AnB----------------- Andres	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
As----------------- Ashkum	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
AyB2----------------- Ayr Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaB2----------------- Barce	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaC2----------------- Barce	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BbA----------------- Barce	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BdB2----------------- Billett	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BeC2----------------- Billett	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BmA----------------- Brems Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bt----------------- Bryce	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Ch----------------- Chalmers	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ck----------------- Comfrey	Fair	Fair	Poor	Fair	Poor	Good	Good	Fair	Fair	Good.
Cm----------------- Comfrey	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CpA----------------- Conover	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
CsA, CsB2----------- Corwin	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
CsC2----------------- Corwin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ct, Cu-------------- Crane	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Do, Dp, Dr---------- Darroch	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Du: Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Dv: Drummer	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Dx: Drummer	Fair	Fair	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
ElA: Elliott	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
ElB2: Elliott	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
FoB2, FpB2, FrB2: Foresman	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ft: Free	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
GlA: Gilboa	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
GlB: Gilboa	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ho: Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
LsA: Lisbon	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MbB2: Markham	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MlB2: Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MlD2: Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MmC3: Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MuB3, MxB2: Montmorenci	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OlA: Odell	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
OlB2: Odell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pn: Peotone	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Pt*. Pits										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RuA, RuB2---------- Rush	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sd----------------- Seafield	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sh, Sk------------- Selma	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
SxA, SxB2---------- Swygert	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
TlA, TlB----------- Tippecanoe	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
VaB2--------------- Varna	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Wa----------------- Wallkill Variant	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wb----------------- Warners Variant	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
WhA, WhB2---------- Wea	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WoA---------------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wt----------------- Wolcott	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AnA, AnB: Andres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
As: Ashkum	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
AyB2: Ayr Variant	Severe: cutbanks cave.	Slight	Moderate: wetness, shrink-swell.	Moderate: slope.	Moderate: frost action.	Slight.
BaB2: Barce	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
BaC2: Barce	Moderate: dense layer, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
BbA: Barce	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
BdB2: Billett	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Slight.
BeC2: Billett	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
BmA: Brems Variant	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Slight.
Bt: Bryce	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
Ch: Chalmers	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Ck: Comfrey	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
Cm: Comfrey	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CpA--------------- Conover	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CsA--------------- Corwin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, low strength, wetness.	Slight.
CsB2-------------- Corwin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Moderate: shrink-swell, low strength, wetness.	Slight.
CsC2-------------- Corwin	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Moderate: shrink-swell, low strength, wetness.	Moderate: slope.
Ct---------------- Crane	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Cu---------------- Crane	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Do---------------- Darroch	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Dp---------------- Darroch	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Dr---------------- Darroch	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Du---------------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Dv---------------- Drummer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Dx---------------- Drummer	Severe: ponding, cutbanks cave.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ElA, ElB2--------- Elliott	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FoB2-------------- Foresman	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength, frost action.	Slight.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
FpB2, FrB2: Foresman	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action, shrink-swell.	Slight.
Ft: Free	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
GlA, GlB: Gilboa	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action, shrink-swell.	Moderate: wetness.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
LsA: Lisbon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MbB2: Markham	Moderate: too clayey, dense layer.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
MlB2: Miami	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
MlD2: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MmC3: Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MuB3, MxB2: Montmorenci	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
OlA, OlB2: Odell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Pn: Peotone	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
Pt*. Pits						
RuA: Rush	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
RuB2: Rush	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Sd---------------- Seafield	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Sh, Sk------------ Selma	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
SxA, SxB2--------- Swygert	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Slight.
TlA, TlB---------- Tippecanoe	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: low strength, frost action.	Slight.
VaB2-------------- Varna	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Wa---------------- Wallkill Variant	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wb---------------- Warners Variant	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, too clayey.
WhA--------------- Wea	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
WhB2-------------- Wea	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
WoA--------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Wt---------------- Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AnA, AnB------------ Andres	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
As------------------ Ashkum	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding.
AyB2---------------- Ayr Variant	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
BaB2---------------- Barce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
BaC2---------------- Barce	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, slope, wetness.
BbA----------------- Barce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
BdB2---------------- Billett	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
BeC2---------------- Billett	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, small stones, slope.
BmA----------------- Brems Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage.
Bt------------------ Bryce	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Ch------------------ Chalmers	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ck, Cm-------------- Comfrey	Severe: flooding, ponding.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: ponding.
CpA----------------- Conover	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CsA, CsB2----------- Corwin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
CsC2--------------- Corwin	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: slope, wetness.
Ct----------------- Crane	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Cu----------------- Crane	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
Do, Dp------------- Darroch	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
Dr----------------- Darroch	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness, thin layer.
Du----------------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Dv----------------- Drummer	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
Dx----------------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
ElA, ElB2----------- Elliott	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FoB2, FpB2, FrB2---- Foresman	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: thin layer.
Ft----------------- Free	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
GlA, GlB------------ Gilboa	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ho----------------- Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
LsA---------------- Lisbon	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MbB2--------------- Markham	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MlB2: Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
MlD2: Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MmC3: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MuB3, MxB2: Montmorenci	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
OlA, OlB2: Odell	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Pn: Peotone	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Pt*. Pits					
RuA: Rush	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey, small stones.
RuB2: Rush	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, small stones.
Sd: Seafield	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
Sh, Sk: Selma	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, thin layer.
SxA: Swygert	Severe: wetness, percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
SxB2: Swygert	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
TlA, TlB: Tippecanoe	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: small stones, wetness, thin layer.
VaB2: Varna	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wa: Wallkill Variant	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Wb: Warners Variant	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: hard to pack, ponding.
WhA: Wea	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey.
WhB2: Wea	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
WoA: Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Wt: Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AnA, AnB: Andres	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
As: Ashkum	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
AyB2: Ayr Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BaB2, BaC2, BbA: Barce	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BdB2: Billett	Good	Probable	Probable	Fair: small stones, area reclaim.
BeC2: Billett	Good	Probable	Probable	Fair: small stones, area reclaim, slope.
BmA: Brems Variant	Fair: wetness.	Probable	Improbable: too sandy.	Poor: thin layer.
Bt: Bryce	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ch: Chalmers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ck, Cm: Comfrey	Poor: wetness.	Probable	Probable	Poor: wetness.
CpA: Conover	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
CsA, CsB2, CsC2: Corwin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Ct: Crane	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Cu: Crane	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Do, Dp: Darroch	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Dr-------------------- Darroch	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Du-------------------- Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Dv-------------------- Drummer	Poor: wetness.	Probable-------------	Probable-------------	Poor: wetness.
Dx-------------------- Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ElA, ElB2------------- Elliott	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
FoB2, FpB2------------ Foresman	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
FrB2------------------ Foresman	Fair: low strength, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Ft-------------------- Free	Poor: wetness.	Probable-------------	Probable-------------	Poor: area reclaim, wetness.
GlA, GlB-------------- Gilboa	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ho-------------------- Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
LsA------------------- Lisbon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MbB2------------------ Markham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MlB2------------------ Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MlD2------------------ Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MmC3------------------ Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MuB3, MxB2------------ Montmorenci	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
OlA, OlB2------------- Odell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pn------------------- Peotone	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pt*. Pits				
RuA, RuB2------------ Rush	Good-----------------	Probable-------------	Probable-------------	Fair: area reclaim.
Sd------------------- Seafield	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Sh, Sk--------------- Selma	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SxA, SxB2------------ Swygert	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
TlA, TlB------------- Tippecanoe	Good-----------------	Probable-------------	Probable-------------	Poor: small stones, area reclaim.
VaB2----------------- Varna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Wa------------------- Wallkill Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Wb------------------- Warners Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
WhA, WhB2------------ Wea	Good-----------------	Probable-------------	Probable-------------	Fair: small stones.
WoA------------------ Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wt------------------- Wolcott	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AnA-----Andres	Moderate: seepage.	Severe: slow refill.	Frost action---	Wetness--------	Wetness, erodes easily.	Wetness, erodes easily.
AnB-----Andres	Moderate: seepage, slope.	Severe: slow refill.	Frost action, slope.	Wetness, slope.	Wetness, erodes easily.	Wetness, erodes easily.
As-----Ashkum	Slight---------	Severe: slow refill.	Ponding, frost action.	Ponding, rooting depth.	Ponding--------	Wetness, rooting depth.
AyB2-----Ayr Variant	Severe: seepage.	Severe: slow refill, cutbanks cave.	Deep to water	Soil blowing, rooting depth, slope.	Soil blowing---	Rooting depth.
BaB2-----Barce	Moderate: seepage, slope.	Severe: slow refill.	Deep to water	Slope----------	Favorable------	Favorable.
BaC2-----Barce	Severe: slope.	Severe: slow refill.	Deep to water	Slope----------	Slope----------	Slope.
BbA-----Barce	Moderate: seepage.	Severe: slow refill.	Deep to water	Favorable------	Favorable------	Favorable.
BdB2-----Billett	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Slope, soil blowing, rooting depth.	Too sandy, soil blowing.	Rooting depth.
BeC2-----Billett	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
BmA-----Brems Variant	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing, rooting depth.	Wetness, soil blowing.	Rooting depth.
Bt-----Bryce	Slight---------	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Ch-----Chalmers	Moderate: seepage.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
Ck, Cm-----Comfrey	Moderate: seepage.	Severe: cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding--------	Wetness.
CpA-----Conover	Slight---------	Severe: slow refill.	Frost action---	Wetness, rooting depth.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
CsA-----Corwin	Moderate: seepage.	Severe: slow refill.	Favorable------	Wetness, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
CsB2-----Corwin	Moderate: seepage, slope.	Severe: slow refill.	Slope----------	Wetness, rooting depth, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
CsC2: Corwin	Severe: slope.	Severe: slow refill.	Slope	Wetness, rooting depth, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Ct: Crane	Severe: seepage.	Severe: cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
Cu: Crane	Severe: seepage.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
Do: Darroch	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness	Wetness.
Dp: Darroch	Slight	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Wetness.
Dr: Darroch	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Frost action	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Du: Drummer	Moderate: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Dv: Drummer	Severe: seepage.	Moderate: slow refill, cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
Dx: Drummer	Moderate: seepage.	Moderate: cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
ElA: Elliott	Slight	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
ElB2: Elliott	Moderate: slope.	Severe: slow refill.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
FoB2: Foresman	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Deep to water	Slope	Erodes easily	Erodes easily.
FpB2: Foresman	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Deep to water	Rooting depth, slope.	Erodes easily	Erodes easily, rooting depth.
FrB2: Foresman	Moderate: seepage, slope.	Severe: slow refill, cutbanks cave.	Deep to water	Percs slowly, rooting depth, slope.	Erodes easily	Erodes easily, rooting depth.
Ft: Free	Severe: seepage.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.
GlA: Gilboa	Moderate: seepage.	Severe: slow refill.	Favorable	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
GlB: Gilboa	Moderate: seepage, slope.	Severe: slow refill.	Slope	Wetness, slope.	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ho-----------------Houghton	Severe: seepage.	Severe: slow refill.	Frost action, subsides, ponding.	Soil blowing, ponding.	Ponding, soil blowing.	Wetness.
LsA-----------------Lisbon	Moderate: seepage.	Severe: slow refill.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
MbB2-----------------Markham	Moderate: slope.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MlB2-----------------Miami	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, rooting depth, erodes easily.	Erodes easily	Erodes easily, rooting depth.
MlD2, MmC3--------Miami	Severe: slope.	Severe: no water.	Deep to water	Slope, rooting depth, erodes easily.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
MuB3, MxB2--------Montmorenci	Moderate: seepage, slope.	Severe: slow refill.	Frost action, slope.	Slope, wetness, rooting depth.	Wetness--------	Rooting depth.
OlA-----------------Odell	Moderate: seepage.	Severe: slow refill.	Frost action---	Wetness, rooting depth.	Wetness, erodes easily.	Wetness, erodes easily, rooting depth.
OlB2-----------------Odell	Moderate: slope, seepage.	Severe: slow refill.	Frost action, slope.	Wetness, slope, rooting depth.	Wetness, erodes easily.	Wetness, erodes easily, rooting depth.
Pn-----------------Peotone	Slight---------	Severe: slow refill.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
Pt*. Pits						
RuA-----------------Rush	Moderate: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
RuB2-----------------Rush	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Sd-----------------Seafield	Severe: seepage.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
Sh, Sk-------------Selma	Moderate: seepage.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, percs slowly.	Ponding--------	Wetness.
SxA-----------------Swygert	Slight---------	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly, erodes easily.	Percs slowly, erodes easily.
SxB2-----------------Swygert	Moderate: slope.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly, erodes easily.	Percs slowly, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
TlA: Tippecanoe	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Favorable	Erodes easily	Erodes easily.
TlB: Tippecanoe	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Slope	Erodes easily	Erodes easily.
VaB2: Varna	Moderate: slope.	Severe: no water.	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly.
Wa: Wallkill Variant	Severe: seepage.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
Wb: Warners Variant	Severe: seepage.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, slow intake, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
WhA: Wea	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
WhB2: Wea	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
WoA: Whitaker	Moderate: seepage.	Moderate: slow refill, cutbanks cave.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Wt: Wolcott	Moderate: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AnA, AnB--------- Andres	0-12	Silt loam--------	CL, OL	A-7, A-6	0	95-100	95-100	90-99	80-94	35-50	13-21
	12-40	Silty clay loam, clay loam, sandy clay loam.	CL	A-7	0-5	85-100	80-100	65-100	50-85	40-50	16-26
	40-60	Silty clay loam, silt loam.	CL	A-6, A-7	0-5	90-100	85-100	80-100	70-95	28-48	11-26
As--------------- Ashkum	0-18	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	75-100	40-60	20-35
	18-30	Silty clay loam, silty clay.	CL, CH	A-7	0	100	90-100	85-100	75-100	45-65	20-35
	30-60	Silty clay loam, silty clay.	CL	A-7, A-6	0-5	95-100	85-100	80-100	75-95	35-50	15-30
AyB2------------- Ayr Variant	0-10	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	100	95-100	65-85	30-50	<20	NP-5
	10-22	Loamy sand-------	SM	A-2-4	0	100	95-100	50-80	15-35	<20	NP-3
	22-33	Fine sandy loam	SM-SC, SC	A-2-4, A-4	0	90-100	85-100	50-90	25-50	20-30	5-10
	33-55	Loam-------------	CL	A-4, A-6	0-3	95-100	90-95	75-95	55-75	20-35	7-15
	55-60	Loam, silt loam	CL, CL-ML	A-4, A-6	0-3	85-100	80-95	75-85	50-75	20-30	5-11
BaB2, BaC2------- Barce	0-12	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	50-90	15-30	4-15
	12-17	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-4, A-2-6	0	90-100	85-100	70-100	30-80	25-35	8-15
	17-40	Gravelly sandy clay loam.	SC	A-2-6, A-6	0-3	70-90	65-85	50-80	25-50	30-35	10-15
	40-48	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-100	70-95	50-75	20-35	5-15
	48-60	Loam-------------	CL, CL-ML	A-4	0-3	90-100	85-100	70-95	50-75	20-30	5-10
BbA-------------- Barce	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	50-90	15-30	4-15
	12-17	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-4, A-2-6	0	90-100	85-100	70-100	30-80	25-35	8-15
	17-40	Gravelly sandy clay loam.	SC	A-2-6, A-6	0-3	70-90	65-85	50-80	25-50	30-35	10-15
	40-48	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-100	70-95	50-75	20-35	5-15
	48-60	Loam-------------	CL, CL-ML	A-4	0-3	90-100	85-100	70-95	50-75	20-30	5-10
BdB2------------- Billett	0-8	Sandy loam-------	SM, SC, SM-SC	A-4, A-2	0	100	95-100	60-100	25-50	<26	NP-8
	8-32	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4, A-2	0-10	90-100	90-100	60-100	25-50	<28	NP-9
	32-39	Loamy fine sand, sandy loam, loamy sand.	SM	A-2, A-4	0-10	75-100	75-100	75-90	20-45	<21	NP-4
	39-60	Fine sand, sand, gravelly sand.	SM, SP, SP-SM	A-2, A-4, A-3	0-10	60-100	60-100	20-95	25-40	---	NP
BeC2------------- Billett	0-8	Loam-------------	SM, SM-SC, SC	A-2, A-4	0	100	100	85-100	25-50	<25	2-10
	8-14	Sandy loam, fine sandy loam.	SM-SC, SC	A-2, A-4, A-6	0-10	90-100	90-100	85-100	25-50	20-30	5-15
	14-37	Loamy sand, sandy loam, fine sandy loam.	SM, SM-SC, SC	A-2, A-4, A-6	0-10	75-100	75-100	75-90	20-45	15-30	3-15
	37-60	Loamy sand, sand, gravelly loamy sand.	SM, SM-SC, SW-SM, SP-SM	A-2, A-1-b, A-3	0-10	60-100	60-100	20-75	5-30	<25	NP-5

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BmA-------------- Brems Variant	0-7	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	65-85	35-55	<20	NP-4
	7-18	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	65-85	35-55	<20	NP-4
	18-38	Loamy fine sand, fine sand.	SM, SP-SM	A-1-b, A-2-4	0	95-100	90-100	45-80	10-35	<20	NP-3
	38-60	Loamy fine sand	SM, SP-SM	A-1-b, A-2-4	0	95-100	90-100	45-75	10-30	<20	NP-3
Bt--------------- Bryce	0-18	Silty clay-------	CH, CL	A-7	0	100	100	95-100	85-95	45-60	20-30
	18-45	Silty clay, clay	CH	A-7	0-5	95-100	95-100	95-100	75-95	50-60	25-35
	45-60	Silty clay, silty clay loam, clay.	CH, CL	A-7	0-5	95-100	90-100	90-100	75-95	40-65	20-40
Ch--------------- Chalmers	0-12	Silty clay loam	CL	A-6	0	100	95-100	85-100	70-95	30-40	10-20
	12-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	70-95	30-45	10-20
	34-48	Loam, silt loam	CL	A-4, A-6	0	95-100	90-100	85-100	60-85	25-40	8-18
	48-60	Silt loam, loam	CL-ML, CL	A-4, A-6	0	95-100	85-100	85-100	65-90	20-35	5-15
Ck, Cm----------- Comfrey	0-6	Silty clay loam	CL	A-6	0	95-100	90-100	80-100	65-95	30-40	10-15
	6-32	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	95-100	90-100	75-100	55-95	20-40	7-20
	32-46	Loam, clay loam	CL	A-4, A-6	0	90-100	85-100	70-100	50-80	20-40	7-20
	46-60	Sand, loamy sand, gravelly coarse sand.	SP, SP-SM, SM, SW	A-1, A-3, A-2-4	0-5	60-95	55-90	25-70	1-30	<20	NP-2
CpA-------------- Conover	0-12	Silt loam--------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-95	55-90	20-30	3-10
	12-30	Clay loam, silty clay loam, loam.	CL	A-6	0-5	95-100	90-100	80-95	50-90	29-40	15-25
	30-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	50-75	25-34	6-14
CsA, CsB2, CsC2-- Corwin	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-90	20-30	4-12
	11-30	Clay loam, loam	CL	A-6, A-4	0	90-100	85-100	75-100	50-80	30-40	9-15
	30-60	Loam, silt loam	CL, ML, CL-ML	A-4	0-3	85-95	80-90	75-85	50-75	<25	3-8
Ct--------------- Crane	0-10	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	70-90	20-30	5-15
	10-36	Clay loam, loam	CL	A-6	0	95-100	75-100	60-100	60-100	30-40	10-15
	36-53	Gravelly sandy clay loam, gravelly sandy loam.	SC, SM-SC, GC, GM-GC	A-6, A-4, A-2-4, A-2-6	0-5	60-80	55-75	40-70	15-45	20-35	5-15
	53-60	Very gravelly loamy coarse sand, gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	0-7	50-80	35-75	5-45	2-12	---	NP
Cu--------------- Crane	0-11	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-95	55-75	20-30	5-11
	11-27	Clay loam--------	CL	A-6	0	90-100	85-100	75-100	60-80	30-40	10-15
	27-45	Gravelly sandy loam.	SC, SM-SC	A-2-4, A-1-b	0	90-100	55-75	30-55	15-30	<25	5-10
	45-53	Gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2, A-3	0-5	60-85	55-80	15-55	2-10	<15	NP-2
	53-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-100	80-95	70-95	50-75	20-30	5-11

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Do----------------- Darroch	0-15	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	55-90	15-30	3-15
	15-21	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	95-100	80-100	60-95	20-40	7-20
	21-29	Clay loam, sandy clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2	0	100	90-100	70-100	30-80	20-35	5-15
	29-60	Stratified fine sand to silt loam.	SC, ML, CL, SM	A-4	0	100	80-100	70-85	35-85	<25	NP-8
Dp----------------- Darroch	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	70-90	20-35	5-15
	13-31	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	85-95	60-90	20-40	7-20
	31-55	Stratified fine sand to silt loam.	SC, SM-SC, CL, CL-ML	A-2, A-4	0	100	95-100	65-90	30-85	<30	5-10
	55-60	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-95	75-90	50-70	20-30	6-11
Dr----------------- Darroch	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	65-90	20-30	5-11
	11-30	Clay loam--------	CL	A-6	0	95-100	90-100	80-100	60-80	30-40	11-16
	30-48	Stratified sand to silt loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	0	85-100	80-100	65-90	30-80	<25	NP-8
	48-60	Silty clay loam	CL	A-6, A-7	0-3	85-100	80-100	75-100	65-95	30-45	11-20
Du----------------- Drummer	0-14	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	14-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	40-53	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	53-60	Stratified sandy loam to silty clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
Dv----------------- Drummer	0-16	Silty clay loam	CL	A-6, A-7	0	100	100	100	80-100	30-50	15-30
	16-46	Silty clay loam	CL	A-6, A-7	0	100	100	100	80-100	30-50	15-30
	46-52	Clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	50-80	30-50	15-30
	52-60	Sand and gravel, sand.	GM, GW-GM, SW-SM, SM	A-1	0-5	40-95	30-90	30-50	5-15	---	NP
Dx----------------- Drummer	0-18	Silty clay loam	CL	A-6	0	100	95-100	85-100	80-95	30-40	11-16
	18-44	Silty clay loam	CL	A-6	0	100	95-100	85-100	80-95	30-40	11-16
	44-53	Stratified silt loam to loamy sand.	CL-ML, CL, ML, SM-SC	A-6, A-4	0	95-100	90-100	50-100	45-90	15-30	3-15
	53-60	Stratified sand to silt loam.	CL-ML, SM-SC, SM, ML	A-4, A-2-4	0	85-100	85-100	65-90	30-80	<25	NP-8
ElA, ElB2--------- Elliott	0-10	Silt loam--------	CL	A-6, A-4	0	95-100	95-100	95-100	75-100	30-40	8-18
	10-33	Silty clay, silty clay loam, clay.	CH, CL	A-6, A-7	0-5	95-100	90-100	90-100	70-100	30-52	11-26
	33-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	90-100	85-100	80-100	70-95	28-45	11-24
FoB2-------------- Foresman	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-100	55-90	20-30	5-15
	10-39	Clay loam, silty clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	95-100	90-100	70-100	35-90	20-40	5-20
	39-60	Stratified sand to silt loam.	SM, SM-SC, ML, CL-ML	A-4	0	85-100	80-100	75-95	45-85	<25	NP-8

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
FpB2------------- Foresman	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	55-90	20-30	5-11
	10-36	Loam, clay loam	CL	A-4, A-6	0	95-100	90-100	75-100	55-80	20-40	7-20
	36-48	Stratified sand to silt loam.	CL-ML, ML, SM, SM-SC	A-4, A-2-4	0	85-100	80-100	65-90	30-80	<25	NP-8
	48-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-100	80-95	70-95	50-75	20-30	5-11
FrB2------------- Foresman	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	90-100	75-95	55-75	20-30	5-11
	10-34	Loam, clay loam	CL	A-4, A-6	0	95-100	90-100	75-100	55-80	20-40	7-20
	34-50	Stratified sand to silt loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	0	85-100	80-100	65-90	30-80	<25	NP-8
	50-60	Silty clay loam	CL	A-6, A-7	0-3	85-100	80-100	75-100	65-95	30-45	11-20
Ft--------------- Free	0-16	Clay loam--------	CL	A-6	0	95-100	85-100	80-100	65-80	30-40	11-16
	16-31	Clay loam, loam	CL	A-6	0	80-100	75-100	65-100	50-80	30-40	11-16
	31-48	Gravelly clay loam, gravelly loam.	CL, SC	A-4, A-6, A-2-6, A-2-4	0	80-100	55-75	45-75	30-60	25-40	8-16
	48-52	Gravelly sandy loam.	SC, SM-SC, GM, GC	A-1, A-2-4	0-5	60-90	45-75	25-55	15-30	<25	3-8
	52-60	Gravelly coarse sand, very gravelly loamy coarse sand.	GW-GM, SW-SM, SW, GP	A-1, A-2-4, A-3	0-5	45-90	35-75	15-55	2-12	<20	NP-3
GlA, GlB--------- Gilboa	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	55-90	15-30	4-15
	11-19	Silty clay loam	CL	A-6	0	90-100	80-100	80-100	70-95	30-40	10-20
	19-39	Clay loam, loam	CL	A-6	0-3	90-100	75-95	65-95	50-80	30-40	10-20
	39-45	Loam-------------	CL-ML, CL	A-4, A-6	0-3	90-100	85-100	70-100	50-90	20-35	5-15
	45-60	Loam-------------	CL-ML, CL	A-4	0-3	90-100	85-100	70-100	50-90	20-30	5-10
Ho--------------- Houghton	0-60	Sapric material	PT	A-8	0	---	---	---	---	---	---
LsA-------------- Lisbon	0-12	Silt loam--------	ML	A-6, A-7	0	100	100	95-100	80-95	35-50	10-20
	12-30	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	95-100	95-100	80-98	35-55	15-35
	30-60	Loam, silt loam, silty clay loam.	CL	A-4, A-6, A-7	0-5	90-100	90-100	85-100	70-85	20-45	8-25
MbB2------------- Markham	0-8	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	85-95	23-40	6-17
	8-34	Silty clay, silty clay loam.	CL, CH	A-7	0-10	95-100	90-100	85-100	80-90	40-54	15-28
	34-60	Silty clay loam, clay loam.	CL	A-7, A-6	0-10	95-100	90-100	85-95	80-90	30-45	13-26
MlB2, MlD2------- Miami	0-10	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	10-26	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	26-30	Loam-------------	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-95	25-35	8-15
	30-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
MmC3------------- Miami	0-8	Clay loam--------	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
	8-24	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	24-28	Loam-------------	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-95	25-35	8-15
	28-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MuB3------------- Montmorenci	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-90	20-35	5-15
	8-28	Clay loam, silty clay loam, loam.	CL	A-6	0	95-100	90-100	75-95	55-95	25-40	10-20
	28-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	75-95	50-75	20-30	5-15
MxB2------------- Montmorenci	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-90	20-35	5-15
	8-27	Clay loam, silty clay loam, loam.	CL	A-6	0	95-100	90-100	75-95	55-95	25-40	10-20
	27-32	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	70-95	50-75	20-30	5-15
	32-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	75-95	50-75	20-30	5-15
OlA, OlB2-------- Odell	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	15-30	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	90-95	80-90	65-75	25-40	7-15
	30-60	Loam-------------	ML, CL-ML	A-4	0-3	85-100	85-100	75-85	50-65	<25	2-7
Pn--------------- Peotone	0-12	Silty clay loam	CH, CL	A-7	0	100	95-100	95-100	80-100	40-65	15-35
	12-45	Silty clay loam, silty clay.	CH, CL	A-7	0-5	100	95-100	90-100	85-100	41-70	17-39
	45-60	Silty clay loam, silt loam, silty clay.	CL, CH, ML, MH	A-7, A-6	0-5	95-100	95-100	90-100	75-98	30-60	14-29
Pt*. Pits											
RuA, RuB2-------- Rush	0-8	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	80-95	29-38	7-15
	8-31	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	85-95	40-50	21-26
	31-60	Loam, gravelly sandy clay loam, gravelly clay loam.	CL, SC	A-6, A-7, A-2	1-5	75-95	60-95	50-80	30-60	30-45	15-22
	60-80	Stratified sand to very gravelly loamy coarse sand.	SP, SP-SM, GP-GM, GP	A-1	1-5	30-70	22-55	7-20	2-10	<30	NP
Sd--------------- Seafield	0-9	Fine sandy loam	SM	A-4, A-2-4	0	100	100	60-85	30-50	<30	NP-5
	9-43	Fine sandy loam, sandy loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6, A-2-4, A-2-6	0	100	100	60-95	30-60	15-30	5-15
	43-60	Fine sand, sand, loamy fine sand.	SM	A-2-4	0	100	100	65-85	15-35	<20	NP
Sh--------------- Selma	0-12	Silty clay loam	CL	A-6	0	100	100	85-100	60-90	25-40	11-20
	12-42	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	100	90-100	80-95	55-80	25-40	8-16
	42-50	Stratified sand to silt loam.	SM, SM-SC, CL, CL-ML	A-4	0	90-100	85-100	40-90	40-65	<25	NP-10
	50-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-100	80-95	70-95	50-75	<30	5-11
Sk--------------- Selma	0-12	Silty clay loam	CL	A-6	0	100	100	85-100	60-90	25-40	11-20
	12-37	Loam, clay loam	CL	A-4, A-6	0	100	90-100	80-95	55-80	25-40	8-16
	37-51	Stratified sand to silt loam.	SM, SM-SC, CL, CL-ML	A-4	0	90-100	85-100	40-90	40-65	<25	NP-10
	51-60	Silty clay loam	CL	A-7, A-6	0-3	85-100	80-100	75-100	65-95	30-45	11-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
SxA, SxB2-------- Swygert	0-12	Silty clay loam	CL	A-7, A-6	0	100	95-100	95-100	85-95	35-50	15-25
	12-37	Silty clay, clay	CH	A-7	0-5	95-100	95-100	90-100	75-95	50-60	25-35
	37-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0-5	95-100	95-100	90-100	75-95	40-65	20-40
TlA, TlB--------- Tippecanoe	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	50-90	20-35	5-15
	11-14	Silt loam, silty clay loam.	CL	A-6	0	100	95-100	90-100	85-90	25-40	10-20
	14-30	Clay loam, loam	SC, CL	A-6	0	95-100	75-100	60-100	45-80	25-40	10-20
	30-51	Gravelly sandy clay loam, gravelly sandy loam.	SC, SM-SC	A-2, A-4	0-3	80-90	55-75	30-70	15-45	20-30	5-10
	51-70	Stratified very gravelly coarse sand to gravelly loamy coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-2	0-3	45-70	35-70	10-30	0-25	---	NP
VaB2------------- Varna	0-10	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	95-100	85-95	25-40	8-20
	10-29	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	85-100	85-98	80-98	35-56	15-29
	29-60	Silty clay loam, clay loam.	CL	A-7, A-6	0-10	95-100	85-100	85-98	80-95	30-45	13-26
Wa--------------- Wallkill Variant	0-8	Silty clay loam	CL	A-6	0	100	95-100	90-100	80-95	30-40	10-15
	8-30	Silty clay loam, silty clay.	CL	A-7	0	100	95-100	90-100	80-95	40-50	15-25
	30-60	Sapric material, muck.	PT	A-8	0	---	---	---	---	---	---
Wb--------------- Warners Variant	0-12	Silty clay-------	CL	A-7	0	100	95-100	90-100	85-95	40-50	15-25
	12-23	Silty clay-------	CL	A-7	0	100	95-100	90-100	85-95	40-50	15-25
	23-36	Marl-------------	OL	A-4	0	100	95-100	80-90	60-80	---	NP
	36-49	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	65-90	25-35	5-15
	49-55	Gravelly fine sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1-b	0-3	55-95	50-90	35-80	20-30	<20	NP-5
	55-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-100	80-95	70-95	50-75	20-30	5-11
WhA, WhB2-------- Wea	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-27	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-95	85-95	65-90	35-50	15-30
	27-60	Gravelly sandy loam, gravelly sandy clay loam.	CL, SM-SC, SC, CL-ML	A-4, A-6	0-5	70-85	65-85	60-80	35-65	15-30	5-15
	60-70	Stratified gravelly loamy coarse sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-70	5-20	0-10	---	NP
WoA-------------- Whitaker	0-8	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	60-90	15-35	2-15
	8-33	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	100	95-100	90-100	70-80	20-35	5-15
	33-60	Stratified coarse sand to silt loam.	ML, SM, CL-ML, SM-SC	A-4	0	98-100	98-100	60-85	40-60	<25	NP-7
Wt--------------- Wolcott	0-9	Loam-------------	CL	A-4, A-6	0	100	90-100	85-100	65-90	20-30	8-14
	9-30	Clay loam, loam	CL	A-6, A-7	0	90-100	85-100	85-98	60-90	35-50	18-30
	30-60	Loam-------------	CL, CL-ML	A-4	0	90-100	80-95	80-95	55-95	20-30	4-10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AnA, AnB----------	0-12	21-27	1.20-1.40	0.6-2.0	0.21-0.24	5.6-7.3	Low-----------	0.28	5	6	4-5
Andres	12-40	27-35	1.35-1.60	0.6-2.0	0.16-0.20	5.6-8.4	Moderate-----	0.28			
	40-60	24-35	1.45-1.70	0.2-0.6	0.18-0.20	7.4-8.4	Moderate-----	0.37			
As---------------	0-18	35-40	1.20-1.40	0.2-0.6	0.12-0.23	5.6-7.8	High----------	0.28	5	4	5-7
Ashkum	18-30	35-45	1.30-1.60	0.2-0.6	0.11-0.20	6.1-7.8	High----------	0.28			
	30-60	30-45	1.60-1.75	0.2-0.6	0.18-0.20	6.1-8.4	Moderate-----	0.28			
AyB2-------------	0-10	7-15	1.45-1.55	2.0-6.0	0.10-0.18	5.1-7.3	Low-----------	0.20	5	3	1-2
Ayr Variant	10-22	2-10	1.65-1.80	6.0-20	0.09-0.11	5.1-6.5	Low-----------	0.20			
	22-33	15-20	1.55-1.65	0.6-6.0	0.15-0.17	5.1-6.5	Low-----------	0.28			
	33-55	18-27	1.40-1.60	0.2-0.6	0.15-0.19	6.6-7.8	Moderate-----	0.28			
	55-60	15-27	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
BaB2, BaC2, BbA--	0-12	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.32	5	6	2-4
Barce	12-17	22-30	1.40-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.32			
	17-40	27-30	1.55-1.65	0.6-2.0	0.12-0.15	5.1-7.3	Moderate-----	0.32			
	40-48	18-27	1.55-1.70	0.2-0.6	0.14-0.19	6.6-7.8	Low-----------	0.43			
	48-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.43			
BdB2-------------	0-8	5-15	1.40-1.70	2.0-6.0	0.13-0.18	6.1-7.8	Low-----------	0.20	4	3	1-2
Billett	8-32	8-18	1.40-1.70	2.0-6.0	0.12-0.17	5.1-6.5	Low-----------	0.20			
	32-39	3-10	1.50-1.80	2.0-6.0	0.11-0.14	5.1-7.3	Low-----------	0.20			
	39-60	1-5	1.60-1.90	6.0-20	0.05-0.08	5.1-7.3	Low-----------	0.10			
BeC2-------------	0-8	7-15	1.40-1.70	2.0-6.0	0.13-0.18	5.6-7.8	Low-----------	0.20	5	3	1-2
Billett	8-14	10-18	1.40-1.70	2.0-6.0	0.10-0.15	5.1-6.5	Low-----------	0.20			
	14-37	8-18	1.50-1.80	2.0-6.0	0.05-0.12	5.6-7.3	Low-----------	0.20			
	37-60	2-7	1.60-1.90	6.0-20	0.02-0.10	5.1-7.3	Low-----------	0.10			
BmA--------------	0-7	7-12	1.45-1.55	2.0-6.0	0.16-0.18	5.6-7.3	Low-----------	0.24	5	3	.5-2
Brems Variant	7-18	7-12	1.55-1.65	2.0-6.0	0.15-0.17	5.6-7.3	Low-----------	0.24			
	18-38	2-10	1.65-1.80	6.0-20	0.06-0.11	5.1-6.5	Low-----------	0.17			
	38-60	2-10	1.65-1.80	6.0-20	0.08-0.10	5.1-6.0	Low-----------	0.17			
Bt---------------	0-18	40-48	1.30-1.50	0.2-0.6	0.12-0.21	5.6-7.8	High----------	0.28	5	4	5-7
Bryce	18-45	42-52	1.35-1.60	0.06-0.2	0.09-0.13	6.1-7.8	High----------	0.28			
	45-60	38-60	1.60-1.75	<0.2	0.03-0.05	7.4-8.4	High----------	0.28			
Ch---------------	0-12	27-35	1.25-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	6	3-8
Chalmers	12-34	20-35	1.45-1.60	0.6-2.0	0.18-0.21	6.6-7.8	Moderate-----	0.28			
	34-48	15-25	1.40-1.55	0.6-2.0	0.17-0.20	6.6-7.8	Moderate-----	0.28			
	48-60	12-18	1.70-1.90	0.2-0.6	0.05-0.12	7.4-8.4	Low-----------	0.28			
Ck, Cm-----------	0-6	27-35	1.45-1.55	0.6-2.0	0.17-0.23	6.6-7.8	Moderate-----	0.28	5	7	4-10
Comfrey	6-32	18-35	1.35-1.60	0.6-2.0	0.17-0.22	6.6-7.8	Moderate-----	0.28			
	32-46	18-35	1.40-1.60	0.6-2.0	0.19-0.21	6.6-7.8	Moderate-----	0.28			
	46-60	2-8	1.60-1.70	>20	0.02-0.08	7.4-8.4	Low-----------	0.10			
CpA--------------	0-12	11-22	1.40-1.55	0.6-2.0	0.18-0.24	5.6-7.3	Low-----------	0.28	5	5	2-3
Conover	12-30	25-35	1.45-1.65	0.2-0.6	0.15-0.18	5.6-7.8	Moderate-----	0.28			
	30-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low-----------	0.37			
CsA, CsB2, CsC2--	0-11	12-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	5	5	2-4
Corwin	11-30	25-35	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.28			
	30-60	10-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Ct-----------Crane	0-10	15-27	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	5	2-3
	10-36	25-35	1.40-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Low----------	0.28			
	36-53	18-30	1.50-1.65	0.6-2.0	0.08-0.16	6.1-7.3	Low----------	0.28			
	53-60	1-10	1.60-1.70	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Cu-----------Crane	0-11	15-27	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.28	4	5	3-6
	11-27	27-35	1.55-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.28			
	27-45	15-20	1.55-1.65	0.6-6.0	0.12-0.14	6.1-7.3	Low----------	0.28			
	45-53	2-5	1.75-1.85	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
	53-60	15-27	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Do-----------Darroch	0-15	10-27	1.30-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.28	5	5	2-4
	15-21	18-35	1.45-1.60	0.6-2.0	0.18-0.22	5.6-7.3	Low----------	0.43			
	21-29	20-30	1.40-1.60	0.2-0.6	0.15-0.19	5.6-7.3	Moderate-----	0.32			
	29-60	5-20	1.50-1.70	0.2-0.6	0.07-0.21	7.4-8.4	Low----------	0.43			
Dp-----------Darroch	0-13	15-27	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	5	3-5
	13-31	18-35	1.40-1.60	0.2-0.6	0.15-0.20	5.6-7.3	Moderate-----	0.28			
	31-55	5-20	1.50-1.70	0.2-0.6	0.19-0.21	7.4-8.4	Low----------	0.28			
	55-60	18-25	1.70-1.95	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Dr-----------Darroch	0-11	15-27	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	4	5	3-6
	11-30	27-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	30-48	5-20	1.50-1.80	0.2-0.6	0.07-0.19	7.4-8.4	Low----------	0.43			
	48-60	27-40	1.70-1.85	0.06-0.6	0.04-0.12	7.4-8.4	Moderate-----	0.43			
Du-----------Drummer	0-14	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	14-40	20-35	1.20-1.45	0.6-2.0	0.21-0.24	6.1-7.8	Moderate-----	0.28			
	40-53	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.6-8.4	Moderate-----	0.28			
	53-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	7.4-8.4	Low----------	0.28			
Dv-----------Drummer	0-16	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	5-7
	16-46	27-35	1.20-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.28			
	46-52	22-33	1.30-1.55	0.6-2.0	0.15-0.19	6.6-7.3	Moderate-----	0.28			
	52-60	1-8	1.80-2.10	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
Dx-----------Drummer	0-18	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	18-44	27-35	1.20-1.45	0.6-2.0	0.21-0.24	6.1.1.8	Moderate-----	0.28			
	44-53	10-27	1.30-1.55	0.6-2.0	0.17-0.20	6.6-8.4	Moderate-----	0.28			
	53-60	5-27	1.40-1.70	0.6-2.0	0.11-0.19	7.4-8.4	Low----------	0.28			
ElA, ElB2--------Elliott	0-10	24-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	4	6	4-5
	10-33	35-50	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.28			
	33-60	27-40	1.60-1.75	0.06-0.6	0.14-0.20	7.4-8.4	Moderate-----	0.28			
FoB2-----------Foresman	0-10	15-27	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	5	3-5
	10-39	20-35	1.40-1.60	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.28			
	39-60	5-20	1.50-1.70	0.2-0.6	0.10-0.19	7.4-8.4	Low----------	0.43			
FpB2-----------Foresman	0-10	15-27	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	4	5	2-4
	10-36	18-35	1.35-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.28			
	36-48	5-20	1.50-1.80	0.2-0.6	0.08-0.10	7.4-8.4	Low----------	0.43			
	48-60	15-27	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.43			
FrB2-----------Foresman	0-10	15-27	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.28	4	5	2-4
	10-34	18-35	1.35-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.28			
	34-50	5-20	1.50-1.80	0.2-0.6	0.07-0.19	7.4-8.4	Low----------	0.43			
	50-60	27-40	1.70-1.85	0.06-0.6	0.04-0.12	7.4-8.4	Moderate-----	0.43			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Ft---------------- Free	0-16	27-35	1.50-1.60	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.24	3	6	4-8
	16-31	25-35	1.40-1.65	0.6-2.0	0.13-0.19	6.1-7.3	Moderate-----	0.32			
	31-48	20-35	1.55-1.65	0.6-2.0	0.10-0.13	6.6-7.8	Moderate-----	0.24			
	48-52	10-20	1.55-1.65	0.6-2.0	0.08-0.11	6.6-8.4	Low----------	0.17			
	52-60	1-10	1.65-1.70	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
GlA, GlB--------- Gilboa	0-11	13-25	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	3-5
	11-19	27-35	1.55-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	19-39	22-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	39-45	18-27	1.55-1.70	0.2-0.6	0.13-0.19	6.6-8.4	Low----------	0.37			
	45-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Ho---------------- Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----	2	2	70
LsA--------------- Lisbon	0-12	20-25	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	4	6	3-5
	12-30	25-35	1.15-1.35	0.6-2.0	0.18-0.22	6.1-7.3	Moderate-----	0.43			
	30-60	20-30	1.45-1.65	0.2-0.6	0.07-0.11	6.1-8.4	Low----------	0.43			
MbB2-------------- Markham	0-8	22-27	1.10-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	3	6	2-3
	8-34	35-45	1.40-1.60	0.06-0.6	0.11-0.20	5.6-7.3	Moderate-----	0.37			
	34-60	27-38	1.60-1.85	0.06-0.6	0.14-0.20	7.4-8.4	Moderate-----	0.37			
MlB2, MlD2-------- Miami	0-10	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
	10-26	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.37			
	26-30	20-27	1.45-1.65	0.6-2.0	0.14-0.19	6.6-7.8	Low----------	0.37			
	30-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	0.37			
MmC3-------------- Miami	0-8	27-35	1.35-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37	3	6	.5-3
	8-24	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.37			
	24-28	20-27	1.45-1.65	0.6-2.0	0.14-0.19	6.6-7.8	Low----------	0.37			
	28-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	0.37			
MuB3-------------- Montmorenci	0-8	15-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	8-28	25-34	1.40-1.60	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.32			
	28-60	14-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.32			
MxB2-------------- Montmorenci	0-8	15-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	8-27	25-34	1.40-1.60	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.32			
	27-32	17-27	1.60-1.70	0.6-2.0	0.05-0.12	6.6-7.8	Low----------	0.32			
	32-60	14-22	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.32			
OlA, OlB2--------- Odell	0-15	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	5	2-4
	15-30	25-35	1.50-1.70	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.28			
	30-60	10-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
Pn---------------- Peotone	0-12	33-40	1.20-1.40	0.2-0.6	0.12-0.23	5.6-7.8	High---------	0.28	5	4	5-7
	12-45	35-45	1.30-1.60	0.2-0.6	0.11-0.20	6.1-7.8	High---------	0.28			
	45-60	25-42	1.40-1.65	0.2-0.6	0.18-0.20	6.6-8.4	High---------	0.28			
Pt*. Pits											
RuA, RuB2--------- Rush	0-8	10-20	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.0	Low----------	0.37	5	5	.5-2
	8-31	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	31-60	20-30	1.40-1.55	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.37			
	60-80	2-6	1.60-1.80	>20	0.02-0.04	6.6-8.4	Low----------	0.10			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Sd--------------- Seafield	0-9	5-14	1.40-1.50	2.0-6.0	0.13-0.18	5.1-7.3	Low-----------	0.24	4	3	2-3
	9-43	10-26	1.40-1.60	2.0-6.0	0.13-0.18	4.5-6.0	Low-----------	0.24			
	43-60	4-8	1.50-1.60	>20	0.06-0.08	5.6-7.3	Low-----------	0.15			
Sh--------------- Selma	0-12	27-30	1.35-1.55	0.6-2.0	0.17-0.23	6.1-7.8	Moderate-----	0.28	5	7	2-6
	12-42	20-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.8	Moderate-----	0.28			
	42-50	5-20	1.50-1.70	0.6-2.0	0.19-0.21	6.6-7.8	Low-----------	0.28			
	50-60	15-27	1.70-1.90	0.2-0.6	0.05-0.10	6.6-8.4	Low-----------	0.37			
Sk--------------- Selma	0-12	27-30	1.35-1.55	0.6-2.0	0.17-0.23	6.1-7.8	Moderate-----	0.28	5	7	2-6
	12-37	20-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.8	Moderate-----	0.28			
	37-51	5-20	1.50-1.70	0.6-2.0	0.19-0.21	6.6-7.8	Low-----------	0.28			
	51-60	27-40	1.70-1.85	0.06-0.6	0.04-0.12	6.6-8.4	Moderate-----	0.43			
SxA, SxB2-------- Swygert	0-12	27-40	1.25-1.50	0.2-0.6	0.18-0.22	5.6-7.3	Moderate-----	0.37	3	7	3-5
	12-37	45-50	1.40-1.70	0.06-0.2	0.05-0.12	5.6-8.4	High----------	0.28			
	37-60	38-60	1.40-1.75	<0.06	0.03-0.05	7.4-8.4	High----------	0.28			
TlA, TlB--------- Tippecanoe	0-11	18-27	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low-----------	0.32	4	5	2-5
	11-14	22-35	1.40-1.60	0.6-2.0	0.18-0.22	5.1-6.5	Moderate-----	0.43			
	14-30	22-35	1.40-1.60	0.6-2.0	0.16-0.18	5.6-6.5	Low-----------	0.32			
	30-51	15-22	1.50-1.70	0.6-2.0	0.08-0.12	5.6-7.3	Low-----------	0.20			
	51-70	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
VaB2------------- Varna	0-10	20-27	1.10-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.32	4	6	3-4
	10-29	35-48	1.30-1.60	0.06-0.6	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	29-60	27-40	1.50-1.70	0.2-0.6	0.14-0.20	6.6-8.4	Low-----------	0.32			
Wa--------------- Wallkill Variant	0-8	27-35	1.45-1.55	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.28	5	7	4-10
	8-30	35-45	1.45-1.60	0.06-0.6	0.13-0.22	5.1-7.3	Moderate-----	0.37			
	30-60	---	0.25-0.45	0.2-6.0	0.35-0.45	5.6-7.3	-------------	----			
Wb--------------- Warners Variant	0-12	40-45	1.35-1.55	0.2-0.6	0.12-0.14	6.1-7.3	Moderate-----	0.28	4	4	4-12
	12-23	40-45	1.50-1.60	0.06-0.6	0.11-0.13	6.6-7.3	Moderate-----	0.28			
	23-36	---	---	---	0.18-0.25	7.4-8.4	Low-----------	----			
	36-49	20-27	1.50-1.60	0.2-0.6	0.20-0.22	7.4-8.4	Moderate-----	0.43			
	49-55	5-15	1.65-1.80	2.0-20	0.06-0.10	7.4-8.4	Low-----------	0.24			
	55-60	15-27	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
WhA, WhB2-------- Wea	0-10	18-27	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.32	5	5	2-5
	10-27	20-35	1.40-1.60	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.43			
	27-60	15-25	1.35-1.50	0.6-2.0	0.10-0.12	5.1-7.3	Low-----------	0.24			
	60-70	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
WoA-------------- Whitaker	0-8	8-19	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	8-33	18-33	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	33-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.1-8.4	Low-----------	0.37			
Wt--------------- Wolcott	0-9	18-27	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate-----	0.28	5	6	2-5
	9-30	15-35	1.55-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	30-60	11-25	1.50-1.65	0.6-2.0	0.17-0.19	7.4-8.4	Low-----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
AnA, AnB---------- Andres	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Low.
As---------------- Ashkum	B/D	None---------	---	---	+1-2.0	Apparent	Apr-Jun	High-----	High-----	Moderate.
AyB2-------------- Ayr Variant	B	None---------	---	---	3.0-6.0	Apparent	Dec-May	Moderate	Moderate	High.
BaB2, BaC2, BbA--- Barce	B	None---------	---	---	3.0-4.0	Apparent	Dec-May	Moderate	High-----	Moderate.
BdB2-------------- Billett	B	None---------	---	---	3.0-6.0	Apparent	Nov-Apr	Moderate	Low------	Moderate.
BeC2-------------- Billett	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
BmA--------------- Brems Variant	B	None---------	---	---	2.5-4.0	Apparent	Jan-Apr	Low------	Low------	High.
Bt---------------- Bryce	D	None---------	---	---	+1-1.0	Apparent	Feb-Jun	High-----	High-----	Low.
Ch---------------- Chalmers	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Low.
Ck---------------- Comfrey	B/D	Occasional	Very brief to brief.	Mar-Jun	+.5-1.0	Apparent	Dec-Jun	High-----	High-----	Low.
Cm---------------- Comfrey	B/D	Frequent----	Very brief to brief.	Mar-Jun	+.5-1.0	Apparent	Dec-Jun	High-----	High-----	Low.
CpA--------------- Conover	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	High-----	High-----	Moderate.
CsA, CsB2, CsC2--- Corwin	B	None---------	---	---	2.0-4.0	Apparent	Jan-Apr	Moderate	High-----	Moderate.
Ct---------------- Crane	B	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Low.
Cu---------------- Crane	B	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Do, Dp, Dr-------- Darroch	B	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Du, Dv, Dx-------- Drummer	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
ElA, ElB2--------- Elliott	C	None---------	---	---	1.0-3.0	Apparent	Mar-May	High-----	High-----	Moderate.
FoB2, FpB2, FrB2-- Foresman	B	None---------	---	---	3.0-6.0	Apparent	Dec-May	Moderate	High-----	Moderate.
Ft---------------- Free	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Low.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
GlA, GlB------------ Gilboa	B	None--------	---	---	1.0-3.0	Apparent	Dec-May	Moderate	High-----	Moderate.
Ho------------------ Houghton	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	High-----	High-----	Low.
LsA----------------- Lisbon	B	None--------	---	---	1.0-3.0	Apparent	Nov-May	High-----	High-----	Moderate.
MbB2---------------- Markham	C	None--------	---	---	3.0-6.0	Perched	Mar-May	High-----	Moderate	Moderate.
MlB2, MlD2, MmC3--- Miami	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
MuB3, MxB2---------- Montmorenci	B	None--------	---	---	2.5-6.0	Apparent	Mar-Apr	High-----	High-----	Moderate.
OlA, OlB2----------- Odell	B	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Pn------------------ Peotone	B/D	None--------	---	---	+.5-1.0	Apparent	Feb-Jul	High-----	High-----	Moderate.
Pt*. Pits										
RuA, RuB2----------- Rush	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Moderate.
Sd------------------ Seafield	B	None--------	---	---	1.0-2.0	Apparent	Jan-Apr	High-----	Moderate	High.
Sh, Sk-------------- Selma	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Low.
SxA, SxB2----------- Swygert	C	None--------	---	---	2.0-4.0	Perched	Feb-May	High-----	High-----	Low.
TlA, TlB------------ Tippecanoe	B	None--------	---	---	3.0-6.0	Apparent	Dec-Apr	Moderate	High-----	Moderate.
VaB2---------------- Varna	C	None--------	---	---	3.0-6.0	Perched	Mar-May	High-----	Moderate	Moderate.
Wa------------------ Wallkill Variant	C/D	None--------	---	---	+1-1.0	Apparent	Feb-Jun	High-----	High-----	Moderate.
Wb------------------ Warners Variant	D	None--------	---	---	+1-1.0	Apparent	Dec-Jul	High-----	Moderate	Low.
WhA, WhB2----------- Wea	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
WoA----------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Wt------------------ Wolcott	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	High-----	High-----	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Andres	Fine-loamy, mixed, mesic Aquic Argiudolls
Ashkum	Fine, mixed, mesic Typic Haplaquolls
Ayr Variant	Fine-loamy, mixed, mesic Typic Argiudolls
Barce	Fine-loamy, mixed, mesic Typic Argiudolls
Billett	Coarse-loamy, mixed, mesic Mollic Hapludalfs
Brems Variant	Sandy, mixed, mesic Dystric Eutrochrepts
Bryce	Fine, mixed, mesic Typic Haplaquolls
Chalmers	Fine-silty, mixed, mesic Typic Haplaquolls
Comfrey	Fine-loamy, mixed, mesic Cumulic Haplaquolls
Conover	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Corwin	Fine-loamy, mixed, mesic Typic Argiudolls
Crane	Fine-loamy, mixed, mesic Aquic Argiudolls
Darroch	Fine-loamy, mixed, mesic Aquic Argiudolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Elliott	Fine, illitic, mesic Aquic Argiudolls
Foresman	Fine-loamy, mixed, mesic Typic Argiudolls
Free	Fine-loamy, mixed, mesic Typic Haplaquolls
Gilboa	Fine-loamy, mixed, mesic Aquic Argiudolls
Houghton	Euic, mesic Typic Medisaprists
Lisbon	Fine-silty, mixed, mesic Aquic Argiudolls
Markham	Fine, illitic, mesic Mollic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Montmorenci	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Odell	Fine-loamy, mixed, mesic Aquic Argiudolls
Peotone	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Rush	Fine-silty, mixed, mesic Typic Hapludalfs
*Seafield	Coarse-loamy, mixed, mesic Udollic Ochraqualfs
Selma	Fine-loamy, mixed, mesic Typic Haplaquolls
Swygert	Fine, mixed, mesic Aquic Argiudolls
Tippecanoe	Fine-loamy, mixed, mesic Typic Argiudolls
Varna	Fine, illitic, mesic Typic Argiudolls
Wallkill Variant	Fine, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Warners Variant	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Wea	Fine-loamy, mixed, mesic Typic Argiudolls
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Wolcott	Fine-loamy, mixed, mesic Typic Haplaquolls

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