United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Missouri Department of
Natural Resources and
Missouri Agricultural
Experiment Station

Soil Survey of Clark County, Missouri

How To Use This Soil Survey

General Soil Map

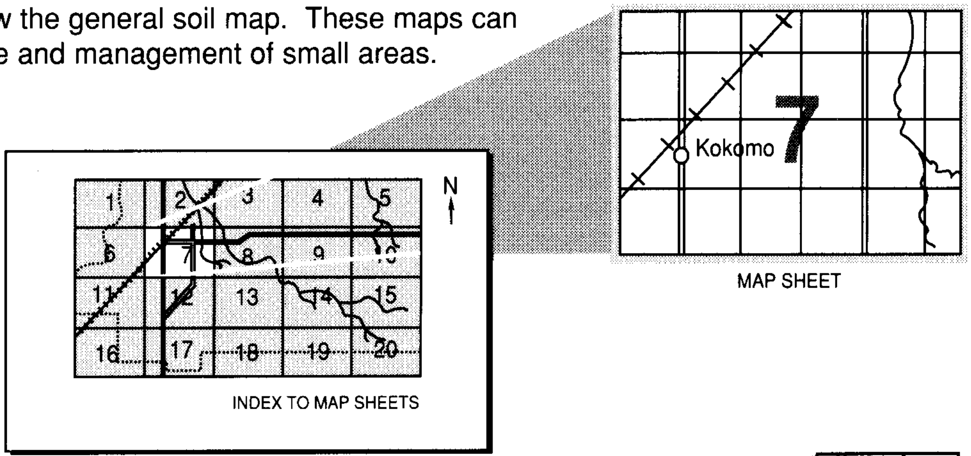
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

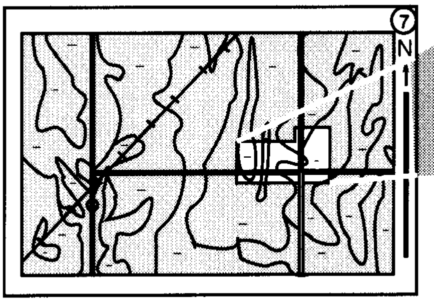
Detailed Soil Maps

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

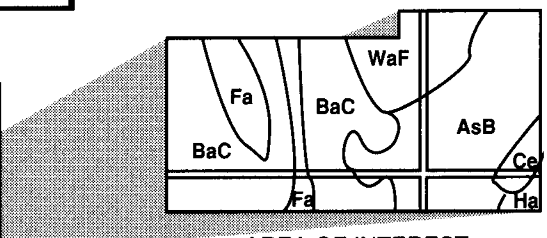
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



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 Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1993. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service, the Missouri Department of Natural Resources, and the University of Missouri Agricultural Experiment Station. Funding for district soil scientists was provided by the Missouri Department of Natural Resources and administered through the Clark County Soil and Water Conservation District. The survey is part of the technical assistance furnished to the Clark County Soil and Water Conservation District.

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

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

Cover: Typical landscape in an area of the Armstrong-Leonard-Gara association in Clark County.

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Issued July 1997

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Foreword

This soil survey contains information that can be used in land-planning programs in Clark County, Missouri. 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 Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Clark County, Missouri

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Missouri Department of Natural Resources and the Missouri Agricultural Experiment Station

Clark County is in the extreme northeast corner of Missouri (fig. 1). The county has a total area of about 327,910 acres, or about 508.6 square miles. This area includes about 980 acres of lakes more than 40 acres in size. The county extends about 24.6 miles from north to south and 21 miles from east to west. Kahoka, the county seat, is in the central part of the county. In 1990, the population of Clark County was about 7,547 and that of Kahoka was 2,195 (U.S. Department of Commerce, 1990).

About 59 percent of the land in the county is used for farming. Cash grain and livestock operations are the major types of farming. Soybeans, corn, hay, and winter wheat are the main crops. Hogs and cattle are the major kinds of livestock raised. Very few specialty crops are grown in the county. Most of the industry in the county is in Kahoka.

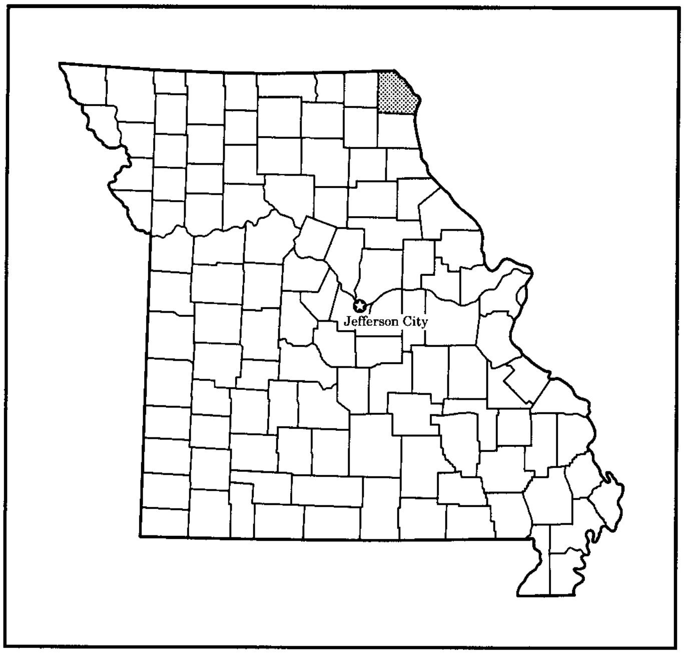

Figure 1.—Location of Clark County in Missouri.

General Nature of the County

This section provides some general information about Clark County. It describes climate; physiography, relief, and drainage; natural resources; transportation facilities; and manufacturing and service for agriculture.

Climate

Clark County is cold in winter and hot in summer. Winter precipitation, frequently in the form of snow, results in a good accumulation of soil moisture by spring and minimizes drought during the summer in most areas. Normal annual precipitation is adequate for all of the crops commonly grown in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Keokuk, Iowa, in the period 1963 to 1993. 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 19 degrees. The lowest temperature on record, which occurred at Keokuk on January 10, 1982, is -22 degrees. In summer, the average temperature is 75 degrees and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Keokuk on July 15, 1936, is 113 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 37.16 inches. Of this, 24.04 inches, or about 65 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall on record was 4.82 inches at Keokuk on September 14, 1961. Thunderstorms occur on about 48 days each year.

The average seasonal snowfall is 20.5 inches. The greatest snow depth at any one time during the period of record was 23 inches. On the average, 8 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 heaviest 1-day snowfall on record was 10.4 inches.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 67 percent of the time possible in summer and 46 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 12 miles per hour, in March.

Physiography, Relief, and Drainage

The highest point in Clark County, 760 feet above sea level, is in Washington Township. The lowest point, 478 feet above sea level, is in Clay Township. Clark County is part of an undulating or gently rolling plain dissected by streams. Some interstream areas are marked by nearly level areas, prominent ridges, and some small knobs. The ridges and rounded knobs, which may contain glacial till and pedisediment, are scattered throughout the county. The flat areas are the broad plains and terraces in the stream valleys of the Wyaconda, Fox, Fabius, Des Moines, and Mississippi Rivers and their tributaries. Some areas within the V-shaped valleys contain limestone and shale. These areas are south and east of a line extending through northern Grant Township and Sweet Home Township and Winchester and extending to the southeast corner of the county.

Most of the watersheds slope to the southeast. The central part of the county is traversed by Sugar Creek and Honey Creek from the northeast corner to within a few miles of the southeast corner, where the waters of the Fox River join the Mississippi River. The northeastern part of the county is drained by the Des Moines and Fox Rivers, and the southwestern part is drained by the Wyaconda and Fabius Rivers.

Natural Resources

Soil is one of the most important natural resources in Clark County. It provides a growing medium for cultivated crops, forage crops, and trees. Also, it can be a source of topsoil and sand and gravel.

The water supply is another abundant resource in the county. Water for farms, homes, and local businesses is supplied by wells at an average rate of 400 gallons per minute. The average depth to a good source of ground water is 75 feet; 150 feet is considered deep, and 15 feet is considered shallow. Four public water systems serve the residents of the county. These are in Kahoka, Wyaconda, Alexandria, and Wayland. All of the public water comes from wells developed in sand or gravel formations.

Mineral resources in the county include coal, limestone, shale, sand, and gravel. Only limestone, sand, and gravel are currently mined.

Transportation Facilities

Clark County has a good system of transportation facilities. The main thoroughfares are U.S. Highways 136 and 61 and State Highway 81. Many farm-to-market roads are located throughout the county. The volume of highway traffic is higher during the hunting season than during other times of the year.

Manufacturing and Service for Agriculture

The county has manufacturing plants for agricultural limestone. It also has a few suppliers of farm machinery, fertilizer, and tile and a company that constructs farm buildings. Tree removal, custom spraying, and seeds for most of the common crops are also available in the county.

How This Survey Was Made

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils on the maps of this soil survey do not fully agree with those on the maps of surveys of adjoining counties that were published at an earlier date. Differences are the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions. In some areas, combining small acreages of similar soils that respond to use and management in much the same way is more practical than mapping the soils separately and giving them different names.

Map Unit Composition

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

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

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

General Soil Map Units

The general soil map at the back of this publication shows 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.

Soil Descriptions

1. Vesser-Klum-Wakeland Association

Very deep, nearly level, moderately well drained, somewhat poorly drained, and poorly drained soils that formed in loamy and silty alluvium; on flood plains

The soils in this association are on low flood plains along the smaller rivers and streams in the western part of the county. Slopes range from 0 to 2 percent.

This association makes up about 10 percent of the county. It is about 33 percent Vesser soils, 31 percent Klum soils, 28 percent Wakeland soils, and 8 percent minor soils (fig. 2).

The Vesser soils are poorly drained. They are in slightly higher areas than the Klum soils. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is dark grayish brown and grayish brown silt loam. The subsoil is grayish brown, mottled silty clay loam.

The Klum soils are moderately well drained. They commonly are in slightly raised areas on the flood plain. Typically, the surface layer is very dark grayish brown fine sandy loam. The substratum is brown, very dark grayish brown, dark grayish brown, dark brown, and pale brown layers of fine sandy loam that has strata of sandy loam and fine sand in the lower part.

The Wakeland soils are somewhat poorly drained. They commonly are in the lower areas adjacent to either the Vesser soils or the uplands. Typically, the surface soil is dark grayish brown silt loam. The substratum is dark grayish brown and grayish brown silt loam.

The minor soils in this association are Alvin, Hoopeston, and Gilford soils on adjacent stream terraces. Alvin soils are well drained. Hoopeston soils are more sandy than the major soils. Gilford soils are poorly drained.

Most areas of these soils are used for corn, soybeans, or winter wheat. A few small areas are wooded. Flooding and wetness are the main management concerns. Some areas are leveed but still are subject to occasional flooding because of levee breaks. Insufficient soil moisture is common during the summer months in areas of the Klum soils.

The Wakeland soils are suitable for trees. Timber stands are small and typically are adjacent to the active stream channel and many old abandoned channels. Flooding is the only major concern affecting timber management.

The soils in this association generally are unsuitable for sanitary facilities and building site development. Flooding and wetness are the major concerns affecting dwellings.

2. Lindley-Keswick-Gorin Association

Very deep, gently sloping to very steep, well drained, moderately well drained, and somewhat poorly drained soils that formed in glacial till and in loess, loamy sediments, and weathered glacial till; on uplands

The soils in this association are on narrow crests and side slopes of highly dissected ridges. Valleys are narrow, commonly less than one-eighth mile wide. Slopes range from 3 to 40 percent.

This association makes up about 22 percent of the county. It is about 36 percent Lindley soils, 31 percent

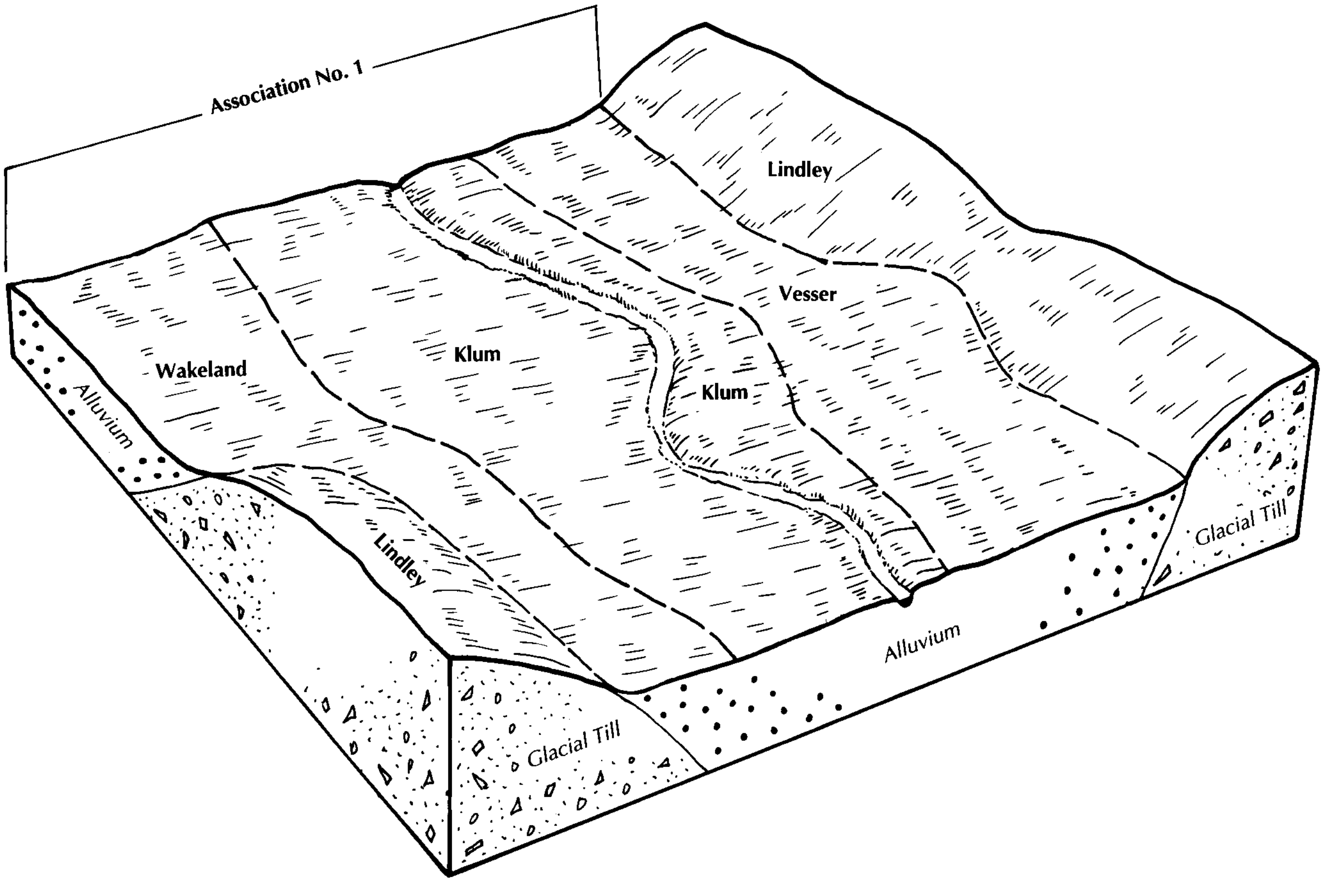

Figure 2.—Typical pattern of soils and parent material in the Vesser-Klum-Wakeland association.

Keswick soils, 30 percent Gorin and similar soils, and 3 percent minor soils (fig. 3).

The Lindley soils are moderately steep to very steep. They are on side slopes. Typically, the surface layer is very dark grayish brown loam. The subsurface layer is brown loam. The subsoil is mainly strong brown loam and clay loam but is dark yellowish brown, mottled loam in the very lower part.

The Keswick soils are moderately sloping to moderately steep. They are on side slopes. Typically, the surface layer is dark grayish brown loam. The subsoil is reddish brown clay loam; reddish brown, mottled clay; and brown, mottled clay loam. The substratum is yellowish brown clay loam.

The Gorin soils are gently sloping and moderately sloping. They are on ridgetops and the upper side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark yellowish brown, mottled silty clay loam in the upper part; yellowish brown and brown, mottled silty clay in the next part; and brown and dark yellowish brown, mottled silty clay loam and yellowish brown loam in the lower part.

The minor soils in this association are Klum, Neeper, and Wakeland soils. The nearly level Klum and Wakeland soils are on narrow flood plains. The gently sloping Neeper soils are on foot slopes below the Lindley soils.

About 50 percent of the acreage in this association is used for corn, soybeans, small grain, or hay. Of the remaining acreage, the less sloping areas, if they have been cleared, are used for pasture and the steeper areas are wooded.

Water erosion is the major management concern if areas of this association are used for cultivated crops or pasture. Improving and maintaining fertility and tilth are also concerns.

The soils in this association are well suited to trees. The woodland areas support predominantly oak and hickory. Improvement of the timber stands is needed. Erosion, seedling mortality, and windthrow are the main management concerns.

These soils are suitable for some kinds of sanitary

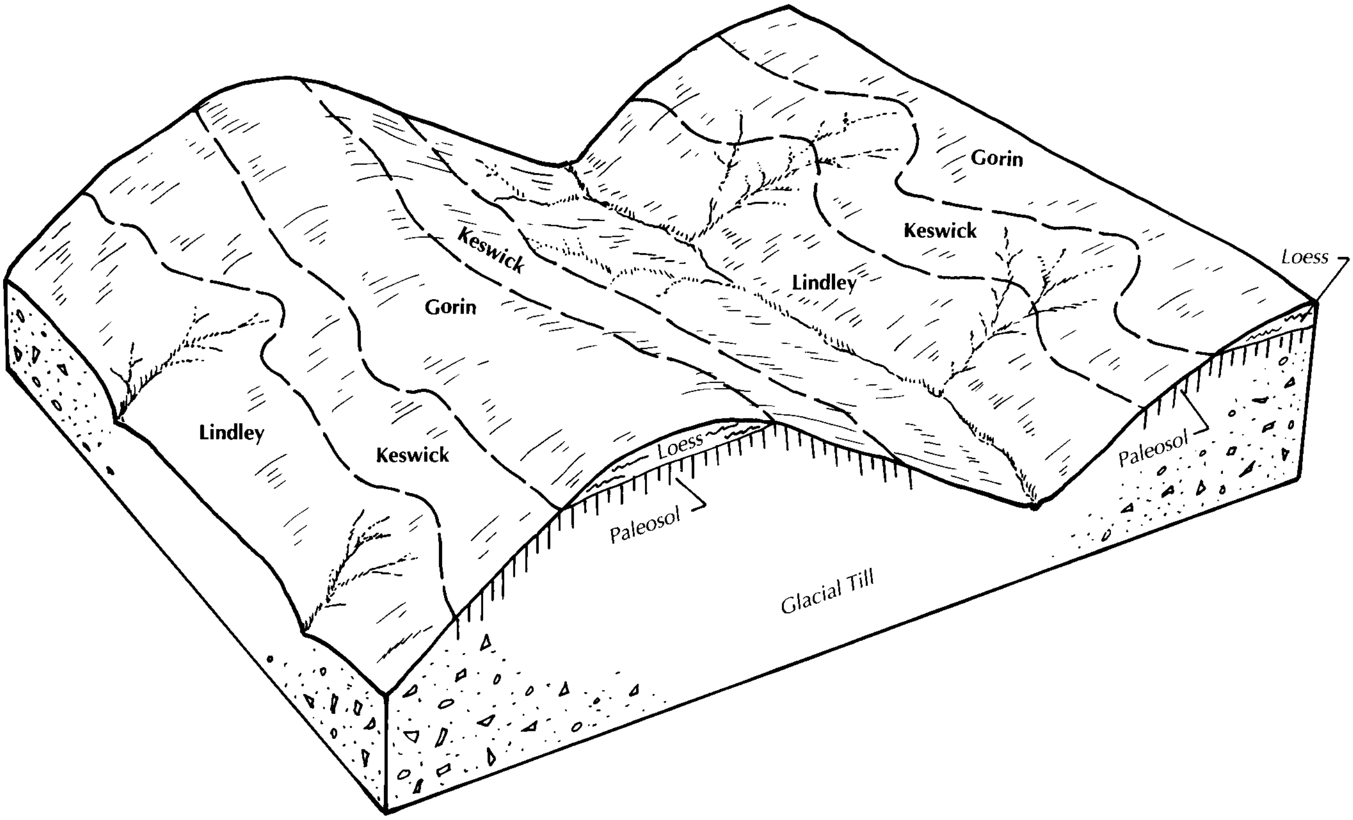

Figure 3.—Typical pattern of soils and parent material in the Lindley-Keswick-Gorin association.

facilities and building site development. Restricted permeability, the slope, and a high shrink-swell potential in the clayey subsoil are the main limitations affecting dwellings.

3. Armstrong-Leonard-Gara Association

Very deep, gently sloping to steep, moderately well drained and poorly drained soils that formed in loamy sediments and weathered glacial till, in loess and weathered glacial till, and in glacial till; on uplands

The soils in this association are on narrow crests, side slopes, and head slopes of ridges. The slopes are short and dissected by drainageways. Slopes range from 3 to 30 percent.

This association makes up about 27 percent of the county. It is about 64 percent Armstrong soils, 14 percent Leonard soils, 13 percent Gara soils, and 9 percent minor soils (fig. 4).

The Armstrong soils are moderately sloping to moderately steep and are moderately well drained. Typically, the surface layer is very dark grayish brown loam. The upper part of the subsoil is reddish brown clay loam and reddish brown and dark brown, mottled clay. The lower part is yellowish brown, mottled clay loam. The substratum is brown, mottled clay loam.

The Gara soils are steep and moderately well drained. Typically, the surface layer is very dark brown loam. The subsoil is dark yellowish brown loam in the very upper part and yellowish brown and strong brown, mottled clay loam in the lower part.

The Leonard soils are gently sloping and moderately sloping and are poorly drained. Typically, the surface layer is very dark grayish brown silty clay loam. The subsoil is dark grayish brown, mottled clay loam and grayish brown and gray, mottled clay. The substratum is gray, mottled clay.

Of minor extent in this association are Adco soils. These soils are nearly level and gently sloping. They are on the wider ridgetops above the Leonard soils.

About 65 percent of the acreage in this association is used for corn, soybeans, or winter wheat. The remaining acreage is used for pasture or hayland or is wooded.

Water erosion is the major management concern affecting crops and pasture. Improving and maintaining fertility and tilth are also concerns.

The soils in this association are suited to trees. At

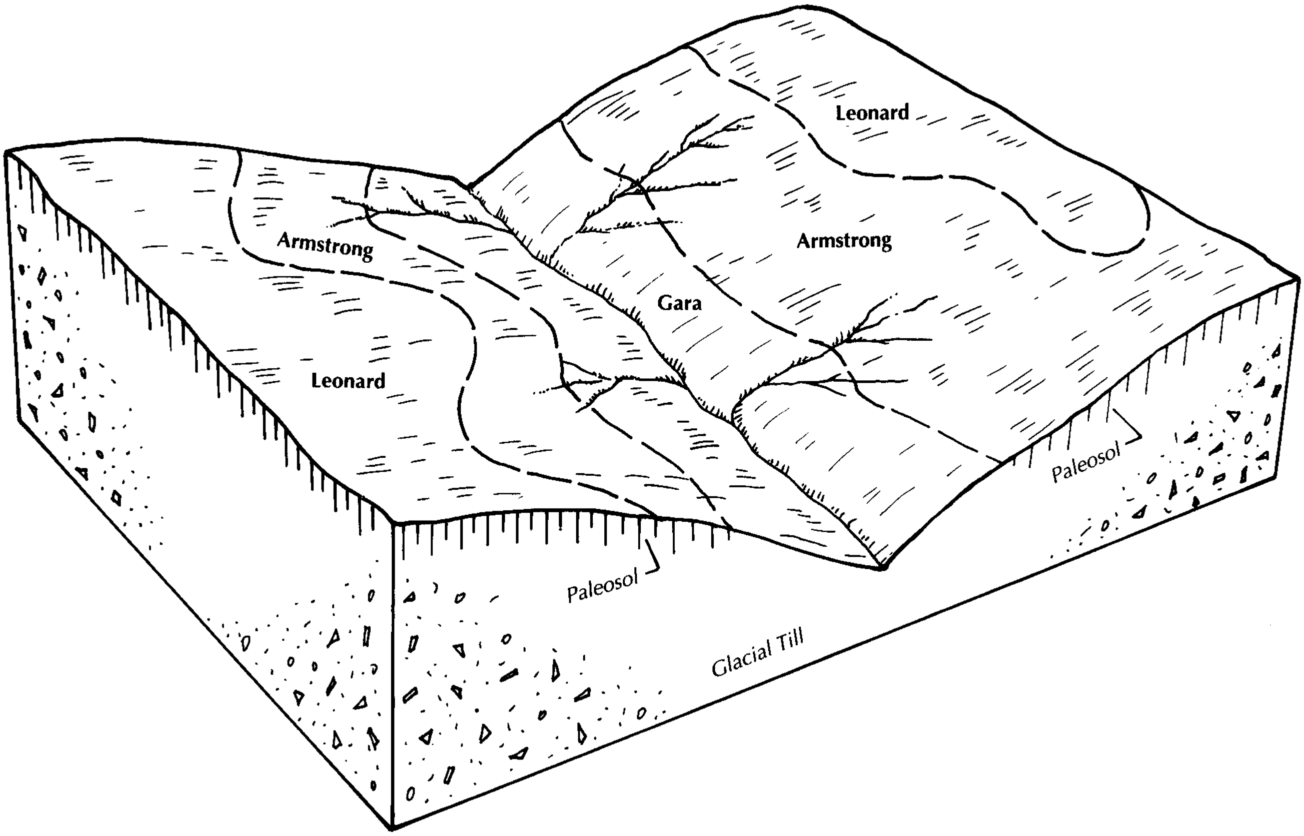

Figure 4.—Typical pattern of soils and parent material in the Armstrong-Leonard-Gara association.

present, only those areas that are too steep or uneven to be cultivated are wooded. The existing timber stands are predominantly oak and hickory. Improvement of the timber stands is needed. Erosion, seedling mortality, and windthrow are the main management concerns.

These soils are suitable for some kinds of sanitary facilities and building site development. Restricted permeability, the slope, a high shrink-swell potential in the clayey subsoil, and wetness are the main limitations affecting dwellings.

4. Adco-Edina Association

Very deep, nearly level to gently sloping, somewhat poorly drained and poorly drained soils that formed in loess; on uplands

The soils in this association are on wide, nearly level divides that finger off to moderately wide ridgetops. These areas are large and are in the highest uplands. Slopes range from 0 to 5 percent.

This association makes up about 15 percent of the county. It is about 65 percent Adco soils, 31 percent Edina and similar soils, and 4 percent minor soils.

The very gently sloping and gently sloping, somewhat poorly drained Adco soils are on slightly convex, moderately wide ridgetops. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is grayish brown silt loam. The upper part of the subsoil is dark grayish brown, dark brown, and yellowish brown, mottled silty clay. The lower part is grayish brown and light brownish gray, mottled silty clay loam.

The nearly level, poorly drained Edina soils are on wide, nearly flat divides. Typically, the surface layer is very dark grayish brown and very dark gray silt loam. The subsurface layer is dark grayish brown silt loam. The upper part of the subsoil is very dark gray and dark gray, mottled silty clay. The lower part is grayish brown, mottled silty clay loam.

The minor soils in this association are Armstrong and Leonard soils. The gently sloping to moderately steep Armstrong soils are on the lower side slopes, and the gently sloping and moderately sloping Leonard soils are on head slopes of small drainageways.

The soils in this association are used mainly for corn, soybeans, or winter wheat.

Water erosion is the major management concern affecting cultivated crops and pasture in the gently sloping areas. Wetness is the main concern in the nearly level areas. It affects tillage and harvesting during most of the spring and fall.

These soils are suitable for some kinds of sanitary facilities and building site development. Restricted permeability, a high shrink-swell potential in the clayey subsoil, and wetness are the main concerns affecting dwellings. Sewage lagoons should function satisfactorily.

5. Moniteau-Plainfield Association

Very deep, nearly level to strongly sloping, poorly drained and excessively drained soils that formed in silty alluvium and windblown sand; on high flood plains and high stream terraces

The soils in this association are on high stream terraces at the base of the uplands and on high flood plains along the Mississippi River. Slopes range from 0 to 12 percent.

This association makes up about 3 percent of the county. It is about 69 percent Moniteau soils, 26 percent Plainfield soils, and 5 percent minor soils.

The nearly level, poorly drained Moniteau soils are on high flood plains below the Plainfield soils. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is grayish brown silt loam. The subsoil is grayish brown, mottled silt loam and dark grayish brown, mottled silty clay loam. The substratum is gray, mottled fine sandy loam.

The nearly level to strongly sloping, excessively drained Plainfield soils are on the crests and escarpments of high stream terraces. Typically, the surface and subsurface layers are very dark brown loamy sand. The subsoil is dark yellowish brown loamy sand. The substratum is yellowish brown sand.

The minor soils in this association are Gilford, Hoopeston, and Wiota soils. The poorly drained, loamy Gilford soils are in slight depressions on flood plains. The somewhat poorly drained, loamy Hoopeston soils and the moderately well drained, silty Wiota soils are in the slightly lower areas that border stream terraces.

About 90 percent of the acreage in this association is used for corn, soybeans, winter wheat, or melons. The rest of the acreage is used for pasture or hayland or is wooded. The main management concerns affecting cultivated crops and pasture are wetness in areas of the Moniteau soils and droughtiness and wind erosion in areas of the Plainfield soils.

These soils are suitable for some kinds of onsite sanitary facilities and building site development. They are severely limited as sites for sanitary facilities because of wetness and restricted permeability in areas of the Moniteau soils and a potential for ground-water contamination in areas of the Plainfield soils.

6. Zook-Colo-Huntsville Association

Very deep, nearly level, poorly drained and well drained soils that formed in silty and clayey alluvium; on flood plains

The soils in this association are on broad, low flood plains along the Mississippi and Des Moines Rivers. Slopes range from 0 to 2 percent.

This association makes up about 10 percent of the county. It is about 40 percent Zook soils, 32 percent Colo and similar soils, 13 percent Huntsville and similar soils, and 15 percent minor soils (fig. 5).

The Zook soils are poorly drained. They are in the lower areas on broad flood plains. Typically, the surface layer is very dark brown silty clay loam. The subsurface layer is black silty clay. The subsoil is dark gray and gray, mottled silty clay and silty clay loam.

The Colo soils are poorly drained. They are in areas slightly below the Huntsville soils. They generally are farther from the stream channel than the Zook soils. Typically, the surface layer is very dark gray silty clay loam. The subsurface layer also is very dark gray silty clay loam. The subsoil is very dark gray and dark gray, mottled silty clay loam.

The Huntsville soils are well drained. They commonly are in the higher raised areas on the flood plain. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is very dark gray silt loam. The subsoil is dark brown silt loam. The substratum is dark brown and dark yellowish brown, mottled silt loam and loam.

The minor soils in this association are Klum and Wakeland soils. These soils are along the smaller rivers and streams. The moderately well drained Klum soils are in landscape positions similar to those of the major soils. The somewhat poorly drained Wakeland soils are in the lower raised areas below the Huntsville soils.

The soils in this association are used mainly for cultivated crops. A few small areas are wooded. Flooding and wetness are the main management concerns. Most areas are leveed but still are subject to occasional flooding because of levee breaks.

The Huntsville soils are suited to trees. No major problems affect timber management.

The soils in this association are unsuitable for sanitary facilities and building site development. Flooding and wetness are the major concerns.

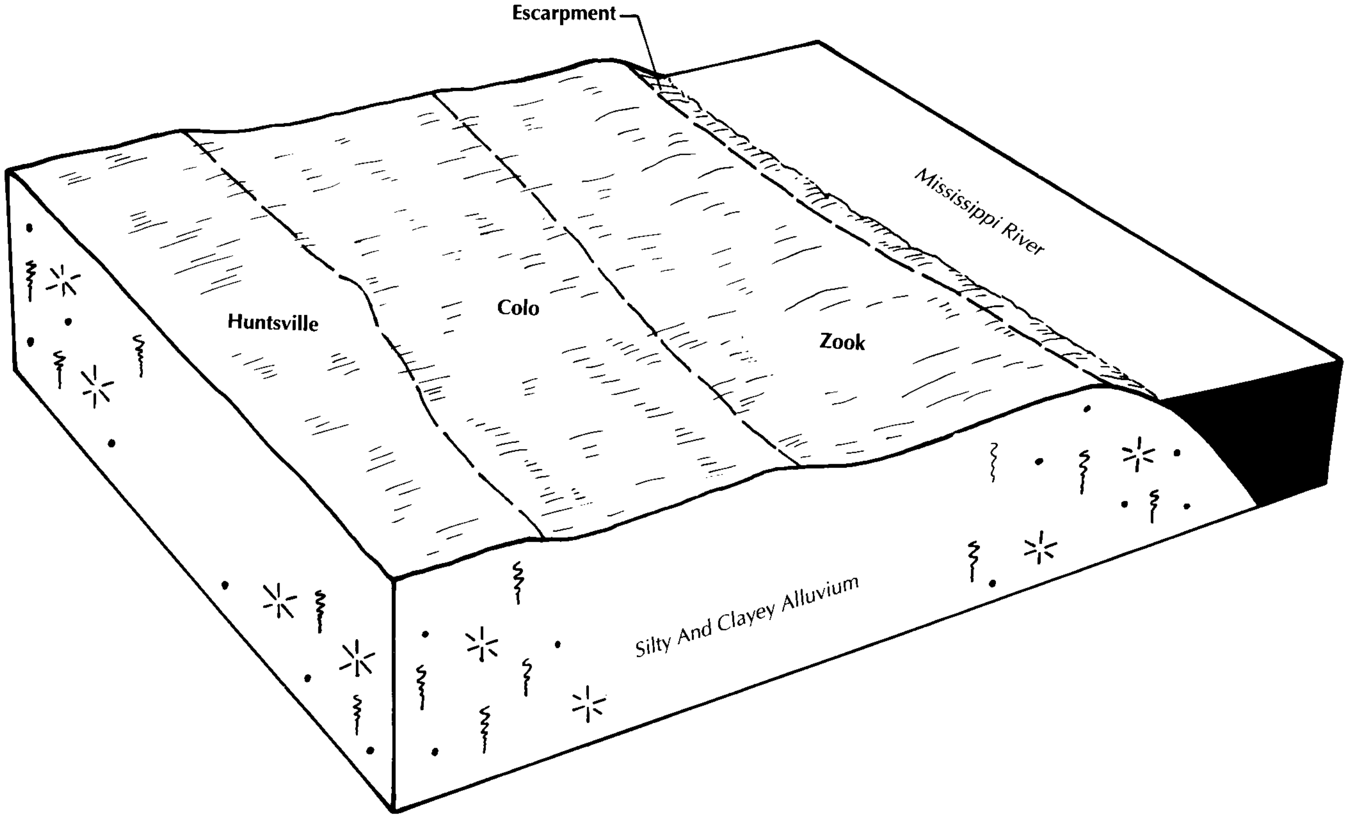

Figure 5.—Typical pattern of soils and parent material in the Zook-Colo-Huntsville association.

7. Lindley-Winfield-Bucklick Association

Very deep and deep, very steep to moderately sloping, well drained and moderately well drained soils that formed in glacial till, in loess, and in loess and limestone residuum; on uplands

The soils in this association are on deeply dissected ridges adjacent to the flood plain along the Mississippi River and in some areas adjacent to the flood plain along the Des Moines River. Slopes range from 5 to 40 percent.

This association makes up about 11 percent of the county. It is about 58 percent Lindley soils, 12 percent Winfield and similar soils, 12 percent Bucklick soils, and 18 percent minor soils (fig. 6).

The Lindley soils are moderately steep to very steep. They are on side slopes. Typically, the surface layer is very dark grayish brown loam. The subsurface layer is brown loam. The upper part of the subsoil is strong brown loam and clay loam. The lower part is dark yellowish brown, mottled loam.

The Winfield soils are moderately sloping and strongly sloping. They are on ridgetops and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown, mottled silty clay loam and silt loam. The substratum is yellowish brown, mottled silt loam.

The Bucklick soils are steep. They are on side slopes. Typically, the surface layer is dark yellowish brown silt loam. The subsurface layer is brown silt loam. The subsoil is red and yellowish red clay loam.

The minor soils in this association are Adco, Marion, Moniteau, and Neeper soils. The very gently sloping and gently sloping Adco and Marion soils are on wide ridgetops. The nearly level Moniteau soils are on high flood plains. The gently sloping and moderately sloping Neeper soils are on foot slopes. They have a thick, dark surface soil.

About 70 percent of the acreage in this association is wooded and supports predominantly oak and hickory. The remaining acreage is used mainly for corn, soybeans, winter wheat, or hayland. Some strongly sloping and moderately steep, uneven areas are used for pasture.

The woodland consists of areas that are too steep to be cultivated. Improvement of the existing stands is

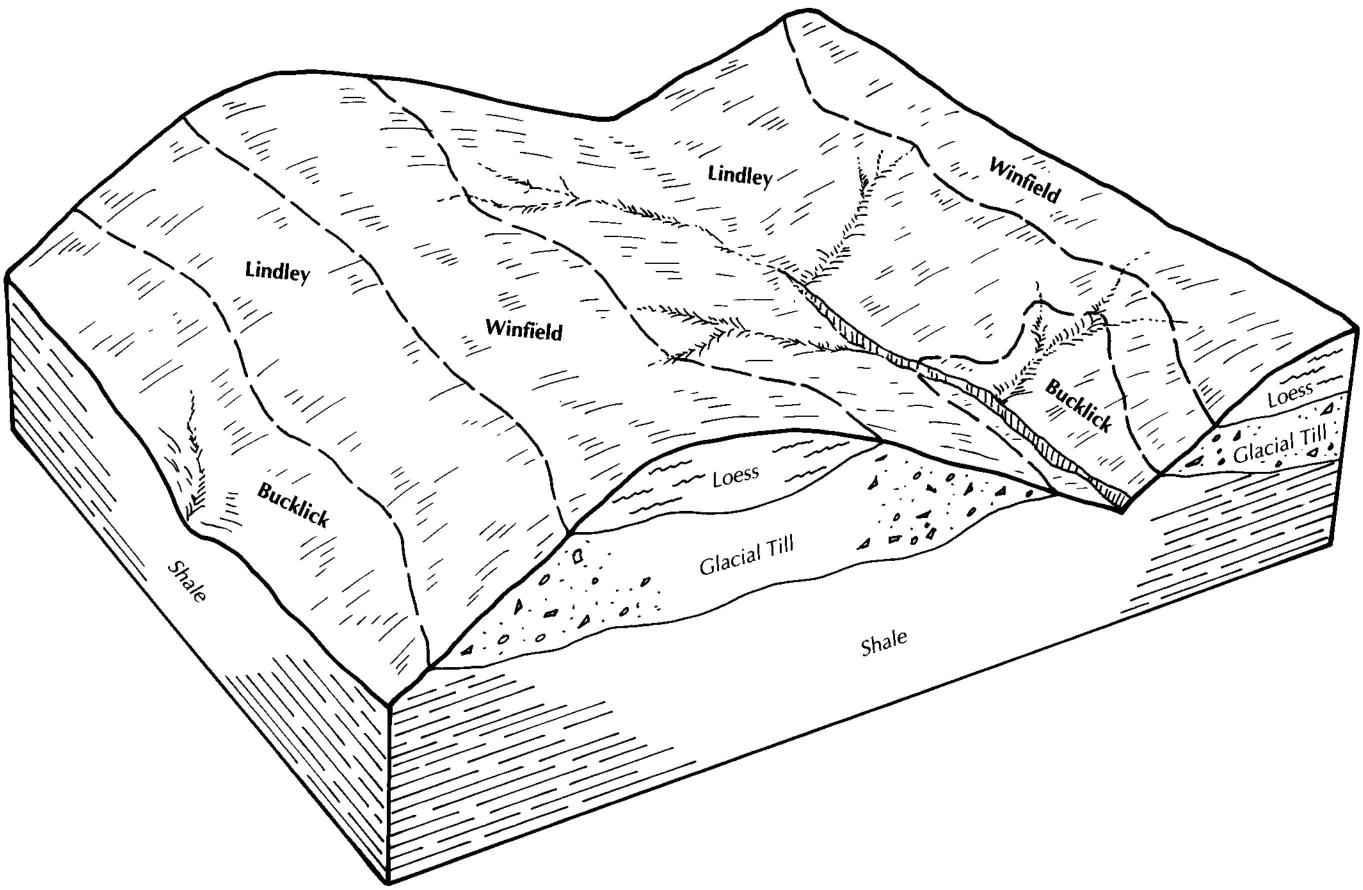

Figure 6.—Typical pattern of soils and parent material in the Lindley-Winfield-Bucklick association.

needed. The steep areas restrict the use of logging equipment. Erosion is the main management concern in areas where the slope is more than 15 percent.

The less sloping areas, most of which are cleared, are suitable for pasture and cropland. The slope and the hazard of water erosion are the main management concerns.

The soils in this association are suitable for some kinds of sanitary facilities and building site development. Restricted permeability, the slope, and a high shrink-swell potential in the clayey subsoil are the main limitations.

8. Perks-Excello Association

Very deep, nearly level, well drained and poorly drained soils that formed in loamy alluvium; on flood plains

The soils in this association are on the broad flood plains along the Mississippi River. Slopes range from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 58 percent Perks soils, 39 percent Excello and similar soils, and 3 percent minor soils.

The Perks soils are higher on the landscape than the Excello soils and are farther away from the channel. Typically, the surface layer is very dark gray loamy sand. The subsurface layer is very dark grayish brown loamy sand. The substratum is dark brown, dark yellowish brown, and brown loamy sand in the upper part and light brown sand in the lower part.

The Excello soils are in the lower areas adjacent to the channel. Typically, the surface layer and subsurface layer are black clay loam. The subsoil is very dark gray and very dark grayish brown sandy clay loam in the upper part and dark gray loam in the lower part. The substratum is dark gray sandy clay loam.

The minor soils in this association are the poorly drained, loamy Gilford soils. These soils are in the lower areas.

Most areas of this association are used for cultivated crops. Droughtiness and wind erosion are the main management concerns in areas of the Perks soils.

Wetness and flooding are the main concerns in areas of the Excello soils.

The soils in this association are unsuitable for building site development and onsite waste disposal because of occasional flooding.

Detailed Soil Map Units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses. The different uses and the associated management practices and considerations are listed in the order of importance for each map unit.

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Armstrong loam, 5 to 12 percent slopes, eroded, is a phase of the Armstrong 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, quarries, 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.

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

01—Wakeland silt loam, frequently flooded. This very deep, nearly level, somewhat poorly drained soil is on narrow flood plains. It is subject to flooding for brief or long periods. Areas are long and narrow and range from 10 to 90 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, dark grayish brown, friable silt loam

Subsurface layer:
6 to 16 inches, dark grayish brown, friable silt loam

Substratum:
16 to 55 inches, dark grayish brown and grayish brown, mottled, friable silt loam
55 to 60 inches, grayish brown, friable silt loam that has thin strata of fine sandy loam

In a few areas the soil is grayer and contains more clay. In some places the fine sandy loam substratum is within a depth of 20 inches.

Included with this soil in mapping are small areas of the moderately well drained Klum soils. These soils are more sandy throughout than the Wakeland soil and are generally closer to the stream channel. They make up about 10 percent of the unit.

Important properties of the Wakeland soil—

Permeability: Moderate

Organic matter content: Moderately low
Available water capacity: Very high
Surface runoff: Slow
Shrink-swell potential: Low
Depth to the water table: 1 to 3 feet

Most areas are used for cultivated crops. Some small areas are used for hay or pasture or are wooded. Corn and soybeans are the commonly grown crops. Flooding is a major management concern. Some crop damage from flooding can be expected about 50 percent of the time, and major crop damage can be expected about 20 percent of the time. Subsurface drains can reduce wetness. Other conservation practices, such as planting cover crops and using a system of conservation tillage that leaves all or part of the crop residue on the surface, can maintain and improve tilth and organic matter content and increase the rate of water infiltration.

This soil is poorly suited to grasses and legumes for pasture and hay because of the flooding. It is best suited to alsike clover, birdsfoot trefoil, and ladino clover. It is poorly suited to deep-rooted legumes, such as alfalfa, because of wetness and damage caused by flooding. The main concerns affecting pasture management are the flooding and the wetness. Restricting use during wet periods and after periods of flooding minimizes surface compaction and helps to maintain good plant density.

This soil is well suited to trees. No soil problems affect timber management, but the flooding can be a major concern affecting equipment operations.

This soil is unsuitable for building site development and septic tank absorption fields because of the flooding.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

02—Klum fine sandy loam, frequently flooded. This very deep, nearly level, moderately well drained soil is in slightly raised areas on flood plains. It is subject to flooding for brief or long periods. Most areas are oval or oblong and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark grayish brown, very friable fine sandy loam

Substratum:
7 to 32 inches, dark grayish brown, very dark grayish brown, dark brown, and brown layers of friable fine sandy loam
32 to 60 inches, very dark grayish brown, dark brown, brown, and pale brown layers of very friable fine sandy loam

In some places the entire soil profile is more sandy, and in other places it is more silty. Some areas that are inside the levee adjacent to the Des Moines and Mississippi Rivers are subject to flooding for long periods.

Included with this soil in mapping are small areas of the poorly drained Vesser and somewhat poorly drained Wakeland soils. Vesser and Wakeland soils are more silty throughout than the Klum soil. They are in slightly raised areas below the Klum soil. Included soils make up about 10 percent of the unit.

Important properties of the Klum soil—

Permeability: Moderately rapid
Organic matter content: Moderately low
Available water capacity: Moderate
Surface runoff: Slow
Shrink-swell potential: Moderate
Depth to the water table: 3 to 5 feet

Most areas are used for cultivated crops. Some areas adjacent to the river that are dissected by stream channels are wooded. A few areas are used for wildlife habitat. Corn and soybeans are the commonly grown crops. Flooding and droughtiness are major management concerns. Some crop damage can be expected in most years (fig. 7). During years when rainfall is below average or poorly distributed during the summer months, crops are subject to severe damage from drought. Planting early in spring and using a system of conservation tillage that leaves all or part of the crop residue on the surface reduce the potential damage caused by drought, maintain or improve tilth and organic matter content, and increase the rate of water infiltration. Sprinkler irrigation systems can be used in most areas to increase crop yields.

This soil is poorly suited to grasses and legumes for pasture and hay because of the flooding. It is best suited to alsike clover, ladino clover, timothy, and switchgrass. Flooding is a major problem affecting pasture management. Restricting use after periods of flooding minimizes surface compaction and helps to maintain good plant density.

This soil is unsuited to building site development and onsite waste disposal systems because of the flooding.

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

08—Huntsville silt loam, occasionally flooded. This very deep, nearly level, well drained soil is in broad raised areas on the flood plains. It is protected from low-level flooding by levees, but it is subject to flooding

Figure 7.—In the background is a flooded area of Klum fine sandy loam, frequently flooded. Huntsville silt loam, occasionally flooded, is in the foreground.

because of levee breaks during major floods. Also, seepage through the levees may cause partial flooding in some areas during extended periods of high water. Most areas of this soil are oval or oblong and range from 10 to 450 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark grayish brown, friable silt loam

Subsurface layer:
7 to 26 inches, very dark gray, friable silt loam

Subsoil:
26 to 46 inches, dark brown, friable silt loam

Substratum:
46 to 60 inches, dark brown and dark yellowish brown, mottled, friable silt loam and loam

Included with this soil in mapping are small areas of Colo, Perks, and Zook soils. The poorly drained Colo and Zook soils have more clay throughout than the Huntsville soil. They are in the lower areas. The well drained Perks soils are more sandy than the Huntsville soil. They are in landscape positions similar to those of the Huntsville soil. Included soils make up about 10 percent of the unit.

Important properties of the Huntsville soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Low
Depth to the water table: 4 to 6 feet

Nearly all areas are used for cultivated crops. Only a few small areas adjacent to stream channels are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding is the main management concern. The soil is protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas (fig. 7). Planting and harvesting may be delayed in some years. Some crop damage from flooding can be expected in some years. The soil is well suited to intensive row cropping. A system of conservation tillage that leaves all or part of the crop residue on the surface can maintain or improve tilth and organic matter content and increase the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to tall fescue, little bluestem, and alfalfa. The main management concern is the flooding. Restricting use after flooding minimizes surface compaction and helps to maintain good plant density.

This soil is well suited to trees. No major soil problems affect timber management.

This soil is unsuited to building site development and onsite waste disposal systems because of the occasional flooding.

The land capability classification is IIw. The woodland ordination symbol is 11A.

15B—Hoopeston fine sandy loam, 1 to 5 percent slopes. This very deep, very gently sloping and gently sloping, somewhat poorly drained soil is on convex low stream terraces. Individual areas are irregular in shape and range from about 5 to 15 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, very dark grayish brown, very friable fine sandy loam

Subsurface layer:
9 to 16 inches, dark brown, very friable fine sandy loam

Subsoil:
16 to 43 inches, dark brown, mottled, friable fine sandy loam

Substratum:
43 to 48 inches, yellowish brown, friable loamy sand
48 to 60 inches, yellowish brown, loose sand

In some places the subsoil contains more clay. In other places the surface layer is very dark gray loamy fine sand. In some areas the substratum is very coarse sand.

Included with this soil in mapping are small areas of the poorly drained Gilford soils. These soils are in the lower areas. They make up about 10 percent of the unit.

Important properties of the Hoopeston soil—

Permeability: Rapid
Organic matter content: Moderate
Available water capacity: Moderate
Surface runoff: Medium
Shrink-swell potential: Low
Depth to the water table: 1 to 3 feet

Most areas are used for cultivated crops. Some areas are used for pasture or hay. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion, wetness, and wind erosion are the main management concerns. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and contour farming help to control erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and organic matter content and increases the rate of water infiltration. Shallow drains can be installed to reduce the wetness. Most areas are too small or narrow to be managed individually, but they can be included with adjacent soils for management with terrace systems, diversions, and contour farming.

This soil is suited to grasses and legumes for pasture or hay. It is well suited to ladino clover, birdsfoot trefoil, tall fescue, timothy, big bluestem, switchgrass, and indiangrass. The main problems affecting pasture management are water erosion and wind erosion during seedbed preparation and the wetness. Timely tillage and a quickly established ground cover reduce excessive soil loss. Proper grazing management and restricted use during wet periods can minimize surface compaction and help to maintain good plant density.

This soil is suitable for building site development. Wetness is a major limitation. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Adequate reinforcement steel, expansion joints, and a gravel base for sidewalks and driveways help to prevent the damage caused by frost action. The soil generally is unsuited to conventional septic tank absorption fields and sewage lagoons because of the wetness or seepage. Sewage generally can be piped to nearby areas where the soils are suitable for onsite waste disposal.

Frost action limits the use of this soil as a site for local roads and streets. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action.

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

17C—Neeper loam, 2 to 7 percent slopes, rarely flooded. This very deep, gently sloping and moderately sloping, well drained soil is on foot slopes in the uplands. Individual areas are irregular in shape and range from about 15 to 30 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, very dark gray, friable loam

Subsurface layer:
6 to 20 inches, very dark gray and very dark grayish brown, friable loam

Subsoil:
20 to 42 inches, dark yellowish brown, firm clay loam
42 to 60 inches, yellowish brown, firm clay loam and yellowish brown, mottled, firm loam

In places the subsoil contains less clay. In some areas the surface layer is dark yellowish brown clay loam. In other areas the substratum is very coarse sand.

Important soil properties—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 4 to 6 feet

Most areas are used for cultivated crops. Some areas are used for pasture or hay. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is the major hazard. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and contour farming help to control water erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and organic matter content and increases the rate of water infiltration. Most areas are too small or narrow to be managed individually, but they can be included with adjacent soils for management with terrace systems, diversions, and contour farming.

This soil is well suited to grasses and legumes for pasture or hay. It is best suited to ladino clover. It is moderately well suited to birdsfoot trefoil, tall fescue, timothy, switchgrass, and indiangrass. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion.

If this soil is used for building site development, rare flooding and the moderate shrink-swell potential are the main limitations on sites for dwellings. Buildings should be constructed on raised, well compacted fill material above the level of any possible flooding. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the damage caused by shrinking and swelling of the soil. Adequate reinforcement steel, expansion joints, and a sand or gravel bases for sidewalks and driveways help to prevent the damage caused by frost action. The soil is suitable for septic tank absorption fields if the design of the fields compensates for the restricted permeability. Properly designed sewage lagoons can also function adequately. Leveling the lagoon site may be necessary. Also, sealing the bottom and sides of the lagoon may be necessary to prevent seepage and the contamination of ground water.

Low strength, the shrink-swell potential, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by shrinking and swelling and by frost action.

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

18B—Jasper fine sandy loam, sandy substratum, 1 to 5 percent slopes. This very deep, very gently sloping and gently sloping, well drained soil is on convex high stream terraces. Individual areas are irregular in shape and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark gray, friable fine sandy loam

Subsurface layer:
7 to 16 inches, very dark grayish brown, friable fine sandy loam

Subsoil:
16 to 25 inches, dark brown, firm fine sandy loam
25 to 34 inches, dark yellowish brown, firm loam
34 to 45 inches, yellowish brown, firm clay loam
45 to 54 inches, dark brown, firm sandy clay loam

Substratum:
54 to 60 inches, dark brown, very friable loamy sand that has thin strata of fine sand and fine sandy loam

In some places the subsoil contain less clay. In other places the surface layer is very dark gray loamy fine sand. In some areas the substratum is very coarse sand.

Included with this soil in mapping are small areas of Gilford and Wiota soils. Gilford soils are poorly drained and are in the lower areas. Wiota soils have more silt throughout than the Jasper soil. They are in landscape positions similar to those of the Jasper soil. Included soils make up about 7 percent of the unit.

Important properties of the Jasper soil—

Permeability: Moderate in the upper part, rapid in the lower part
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: Low
Depth to the water table: More than 6 feet

Most areas are used for cultivated crops. Some areas are used for pasture or hay. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is the main hazard. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and contour farming help to control water erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and organic matter content and increases the rate of water infiltration. Most areas are too small or narrow to be managed individually, but they can be included with adjacent soils for management with conservation tillage systems and contour farming.

This soil is well suited to grasses and legumes for pasture and hay. It is well suited to alfalfa, ladino clover, birdsfoot trefoil, tall fescue, timothy, big bluestem, switchgrass, and indiangrass. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive soil loss.

This soil is suitable for building site development and for properly designed and installed septic tank absorption fields. The limitations affecting these uses are slight. Adequate reinforcement steel, expansion joints, and gravel bases for sidewalks and driveways help to prevent the damage caused by frost action. Because of seepage, the soil generally is unsuitable for sewage lagoons unless enough more slowly permeable soil material is available to seal the berms and bottom of the lagoon. Septic tank absorption fields should function adequately if properly designed and constructed.

Frost action limits the use of this soil as a site for local roads and streets. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by frost action.

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

19A—Plainfield loamy sand, 0 to 3 percent slopes. This very deep, nearly level and very gently sloping, excessively drained soil is on the crest of broad high stream terraces. Individual areas are irregular in shape and range from 100 to 2,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark grayish brown, very friable loamy sand

Subsurface layer:
10 to 20 inches, very dark grayish brown, very friable loamy sand

Subsoil:
20 to 32 inches, dark yellowish brown, very friable loamy sand

Substratum:
32 to 60 inches, yellowish brown, loose coarse sand

In some places the substratum is underlain by very coarse sand and gravel below a depth of 4 feet. In other places the dark surface layer is thinner. In some areas the surface layer is coarse sand or gravelly sand.

Important soil properties—

Permeability: Rapid
Organic matter content: Low
Available water capacity: Low

Surface runoff: Slow
Shrink-swell potential: Low
Depth to the water table: More than 6 feet

Most areas of this soil are used for cultivated crops. Corn, soybeans, and winter wheat are the commonly grown crops. Some vegetables and melons are also grown in a few areas. Insufficient soil moisture during the summer months and the hazard of wind erosion are the main management concerns, especially during extended dry periods. Water erosion also is a hazard. The soil is suited to cultivated crops only on a limited basis. Crop rotations should include several years of pasture and hay crops. The soil is suited to melons and some vegetable crops. Sprinkler irrigation systems can be used in most areas. Using a system of conservation tillage that leaves a protective cover of crop residue on the surface or maintaining cover crops throughout the year also helps to control wind erosion and maintains or improves tilth and organic matter content.

This soil is suited to grasses and legumes for pasture or hay (fig. 8). It is moderately suited to red clover, birdsfoot trefoil, timothy, big bluestem, indiangrass, and little bluestem. The warm-season grasses produce best during the hot summer months. The main concerns affecting pasture management are summer droughtiness and the hazard of wind erosion. Proper grazing management helps to control wind erosion and maintains good plant density.

This soil is moderately suited to trees. The seedling mortality rate is the main management concern. Planting early in spring allows the seedlings to become better established before the dry season. Reinforcement plantings may be necessary to establish adequate stands.

This soil is suited to building site development. No major hazards or limitations affect dwellings. The soil generally is unsuitable for conventional septic tank absorption fields and onsite waste disposal systems because of seepage. Sites for onsite waste disposal are generally available on nearby soils that are suitable.

The land capability classification is IVs. The woodland ordination symbol is 3S.

19C—Plainfield loamy sand, 3 to 12 percent slopes. This very deep, gently sloping to strongly sloping, excessively drained soil is on short, irregular escarpments or terrace risers on high stream terraces. Individual areas are irregular in shape and range from 50 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark gray, very friable loamy sand

Subsurface layer:
10 to 16 inches, very dark grayish brown, very friable loamy sand

Subsoil:
16 to 32 inches, very dark grayish brown and dark yellowish brown, very friable loamy sand

Substratum:
32 to 60 inches, yellowish brown, very friable coarse sand

In some places the substratum is underlain by very coarse sand and gravel below a depth of 4 feet. In other places the dark surface layer is thinner. In some areas the surface layer is coarse sand or gravelly sand.

Important soil properties—

Permeability: Rapid
Organic matter content: Low
Available water capacity: Low
Surface runoff: Moderate
Shrink-swell potential: Low
Depth to the water table: More than 6 feet

Most areas of this soil are used for cultivated crops. Some vegetables and melons are also grown in a few areas. The soil is suited to cultivated crops only on a limited basis because of the hazards of wind erosion and water erosion. Insufficient soil moisture during the summer months also is a management concern. Crop rotations should include several years of pasture or hay crops. Sprinkler irrigation systems can be used in most areas. The soil is suited to melons and some vegetable crops. A cover of grasses and legumes is effective in controlling wind erosion and water erosion.

This soil is suited to grasses and legumes for pasture or hay. It is moderately suited to red clover, birdsfoot trefoil, timothy, big bluestem, indiangrass, and little bluestem. The warm-season grasses produce best during the hot summer months. The main concerns affecting pasture management are water erosion and wind erosion and summer droughtiness. Timely tillage and a quickly established ground cover help to prevent excessive water erosion. Proper grazing management helps to maintain good plant density.

This soil is moderately well suited to trees. The seedling mortality rate is the main management concern. Planting early in spring helps the seedlings to become better established before the dry season. Reinforcement planting may be needed to establish adequate stands.

This soil is suitable for building site development.

Figure 8.—A recently mowed meadow in an area of Plainfield loamy sand, 0 to 3 percent slopes, in the foreground. Perks loamy sand, occasionally flooded, is in the background.

The slope is the main limitation. Land shaping can modify the slope. The soil generally is unsuitable for septic tank absorption fields and onsite waste disposal because of seepage and the slope. Sites for onsite waste disposal are generally available on nearby soils that are suitable.

The slope is the only limitation affecting local roads and streets. The soil can be easily graded or cut and filled.

The land capability classification is IVe. The woodland ordination symbol is 3S.

20—Colo silty clay loam, occasionally flooded. This very deep, nearly level, poorly drained soil is on flood plains. It is protected from low-level flooding by levees, but because of levee breaks it is subject to flooding for very brief to long periods when major flooding occurs. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Individual areas of this soil are irregular in shape and range from about 10 to 900 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, firm silty clay loam

Subsurface layer:
8 to 28 inches, very dark gray and dark gray, mottled, firm silty clay loam

Subsoil:
28 to 60 inches, very dark gray and dark gray, mottled, firm silty clay loam

In some areas the subsoil is silty clay.

Included with this soil in mapping are small areas of the well drained Huntsville soils. These soils have less clay throughout than the Colo soil and are generally closer to the major stream channel. They make up about 5 to 10 percent of the unit.

Important properties of the Colo soil—

Permeability: Moderate
Organic matter content: High
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Depth to the water table: 1 to 3 feet

Most areas are used for cultivated crops. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding and wetness are the main management concerns. The wetness can be reduced by installing shallow surface drains and grading the land. Planting and harvesting may be delayed in some years by flooding. Some crop damage can be expected. A system of conservation tillage that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is best suited to wetness-tolerant species, such as red clover, timothy, and orchardgrass. The main concerns affecting pasture management are the wetness and the flooding. A surface drainage system can benefit the deeper rooted plant species. Proper grazing management and restricted use during wet periods help to control surface compaction and maintain good plant density.

This soil is unsuitable for building site development and most kinds of onsite waste disposal systems because of the occasional flooding.

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

24—Moniteau silt loam, rarely flooded. This very deep, nearly level, poorly drained soil is on high flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, dark grayish brown, friable silt loam

Subsurface layer:
6 to 13 inches, grayish brown, friable silt loam

Subsoil:
13 to 17 inches, grayish brown, mottled, friable silt loam
17 to 55 inches, dark grayish brown, mottled, firm silty clay loam

Substratum:
55 to 60 inches, gray, mottled, firm fine sandy loam

Included with this soil in mapping are small areas of the moderately well drained Weller soils. These soils have more clay in the lower part of the subsoil and the substratum than the Moniteau soil. They are on ridgetops and side slopes. They make up about 5 percent of the unit.

Important properties of the Moniteau soil—

Permeability: Moderately slow
Organic matter content: Moderately low
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1 foot below the surface

Most areas are used for cultivated crops. Some areas are used for pasture and hay. Corn, soybeans, and winter wheat are the commonly grown crops. Wetness is the main limitation. The wetness can be reduced by installing shallow surface drains and grading the land. Where this soil is adjacent to upland areas, constructing diversions provides protection from upland runoff. Returning crop residue to the soil maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is best suited to wetness-tolerant species, such as tall fescue and timothy. It is moderately suited to birdsfoot trefoil, ladino clover, and red clover. Wetness is the main management concern. A surface drainage system benefits the deeper rooted species. Restricted use during wet periods minimizes surface compaction and helps to maintain good plant density.

This soil generally is not used for building site development or onsite waste disposal systems because of the flooding and the wetness. Dwellings should be built on raised, well compacted fill material above the level of flooding. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling.

Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling and by frost action. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately.

Low strength, the high shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Building roads on raised, well compacted fill material, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

26C2—Weller silt loam, 3 to 9 percent slopes, eroded. This gently sloping and moderately sloping, moderately well drained soil is on the crest and side slopes of high stream terraces adjacent to major streams. Erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the upper part of the subsoil by tillage. Individual areas are irregular in shape and range from about 10 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 7 inches, mixed dark brown and brown, friable silt loam

Subsoil:

7 to 11 inches, dark brown, mottled, firm silty clay loam

11 to 52 inches, dark yellowish brown, mottled, firm silty clay

52 to 60 inches, light brownish gray, mottled, firm silty clay loam

In some places the subsoil contains less clay. In other places the soil is silty clay loam throughout. In some areas the dark surface layer is more than 7 inches thick. In other areas the substratum has glacial sand and gravel below a depth of 50 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Marion and poorly drained Moniteau soils. Marion soils generally are on crests above the Weller soil. Moniteau soils are nearly level and are in the lower positions on the adjacent flood plains. Included soils make about 5 percent of the unit.

Important properties of the Weller soil—

Permeability: Slow
Organic matter content: Moderately low
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for cultivated crops. Some areas are used for pasture or hay. A few small areas adjacent to major drainageways and streams are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. If cultivated crops are grown, water erosion is the main hazard. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and contour farming reduce the hazard of water erosion. Returning crop residue to the soil or regularly adding other organic material maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is well suited to grasses and legumes for pasture or hay. It is well suited to ladino clover and moderately well suited to red clover, birdsfoot trefoil, tall fescue, timothy, switchgrass, and big bluestem. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive water erosion.

This soil is suited to trees. Seedling mortality is the main management concern. Planting container-grown stock or reinforcement planting helps to ensure adequate stands.

This soil is suitable for building site development and for certain kinds of onsite waste disposal systems. The high shrink-swell potential, the slope, and wetness are the major limitations affecting dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to minimize the damage caused by shrinking and swelling of the soil. Installing drainage tile around the footings helps to prevent the damage caused by excessive wetness. Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling and by frost action. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately. Leveling the lagoon site may be necessary.

Low strength, the high shrink-swell potential, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to minimize the damage to roads and streets caused by shrinking and swelling and by frost action.

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

27—Zook silty clay loam, occasionally flooded. This nearly level, poorly drained soil is in low backswamp areas on broad flood plains. It is subject to flooding for brief periods. Individual areas are irregular in shape and range from about 10 to 500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, very dark brown, firm silty clay loam

Subsurface layer:
9 to 30 inches, black, firm silty clay

Subsoil:
30 to 49 inches, dark gray, mottled, firm silty clay
49 to 60 inches, gray, mottled, firm silty clay loam

In some places the surface layer is dark grayish brown silt loam. In other places the subsoil contains less clay.

Included with this soil in mapping are some frequently flooded areas adjacent to uplands. Also included are small areas of the well drained Huntsville soils. These soils have less clay and more silt throughout than the Zook soil. Also, they are in slightly raised areas closer to the stream channel. Included areas make up about 10 percent of the unit.

Important properties of the Zook soil—

Permeability: Slow
Organic matter content: High
Available water capacity: High
Surface runoff: Very slow
Shrink-swell potential: High
Seasonal high water table: At the surface to 2 feet below the surface

Most areas are used for cultivated crops. Some areas are used for pasture. A few small areas adjacent to open ditches and small streams are wooded. Corn and soybeans are the commonly grown crops. Flooding and wetness are the main management concerns. Planting and harvesting may be delayed in some years because of the flooding. Some crop damage can be expected. Wetness can be reduced by using shallow surface drains and by land grading. A conservation tillage system that leaves all or part of the crop residue on the surface can maintain or improve tilth and organic matter content and increase the rate of water infiltration.

This soil is suited to some grasses and legumes for pasture. It is best suited to wetness-tolerant, shallow-rooted species. It is moderately suited to birdsfoot trefoil, ladino clover, red clover, tall fescue, and timothy. The main concerns affecting pasture management are the wetness and the flooding. A drainage system is needed. Proper grazing management and restricted use during wet periods and after flooding help to prevent compaction and maintain good plant density.

This soil is unsuitable for building site development and most kinds of onsite waste disposal systems because of the occasional flooding.

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

29F—Lindley loam, 14 to 40 percent slopes. This moderately steep to very steep, well drained soil is on convex side slopes in the uplands. Individual areas occur in a dendritic pattern and range from 25 to 400 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 2 inches, very dark grayish brown, very friable loam

Subsurface layer:
2 to 10 inches, brown, friable loam

Subsoil:
10 to 45 inches, strong brown, firm loam and clay loam

Substratum:
45 to 60 inches, strong brown, firm clay loam and dark yellowish brown, mottled, firm loam

In some places the dark surface layer is 6 inches thick or more. In other places the soil has more clay. In some areas the depth to limestone bedrock is less than 60 inches.

Included with this soil in mapping are small areas of Gorin and Keswick soils. These soils have more clay in the subsoil than the Lindley soil. They are on the less sloping ridgetops and side slopes above the Lindley soil. They make up about 10 percent of the unit.

Important properties of the Lindley soil—

Permeability: Moderately slow
Organic matter content: Moderately low
Available water capacity: Moderate
Surface runoff: Rapid
Shrink-swell potential: Moderate
Depth to the water table: More than 6 feet

Most areas are wooded. A few small areas on ridgetops are used for pasture. This soil is unsuited to cultivated crops because of the slope and the very severe hazard of erosion. It is suited to trees, and most areas support large stands of native hardwoods. The erosion hazard and equipment limitations are the main management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimize the concentration of water. Constructing water breaks reduces the hazard of erosion on haul roads and skid trails. Seeding disturbed areas may be necessary after harvesting is completed. In the steeper areas, logs should be yarded uphill to logging roads or skid trails. Seedlings grow well if competing vegetation is controlled by spraying, cutting, and girdling.

This soil is poorly suited to grasses and legumes for pasture. The main concern affecting pasture management is water erosion during seedbed preparation. Maintaining a good cover of grasses and legumes is effective in minimizing erosion in areas used for pasture. Careful reseeding of grasses helps to ensure the quick establishment of adequate ground cover. Small grain is occasionally grown as a nurse crop when stands of grasses and legumes are reestablished. Birdsfoot trefoil, red clover, tall fescue, timothy clover, and switchgrass grow best. The soil is moderately well suited to orchardgrass, big bluestem, and indiangrass. Proper grazing management is necessary to maintain good plant density. The use of conventional equipment is feasible only in a few small areas. A broadcast method of seeding can be used.

Because of the slope, most areas of this soil generally are not used for building site development or as sites for onsite waste disposal systems.

The land capability classification is VIe. The woodland ordination symbol is 3R.

31C2—Armstrong loam, 5 to 12 percent slopes, eroded. This moderately sloping and strongly sloping, moderately well drained soil is on convex ridgetops and side slopes in the uplands. Water erosion has removed some of the original surface soil. Individual areas are irregular in shape and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark grayish brown, friable loam

Subsoil:
7 to 12 inches, mixed reddish brown and very dark grayish brown, firm clay loam
12 to 28 inches, reddish brown and dark brown, mottled, firm clay
28 to 56 inches, yellowish brown, mottled, firm clay loam

Substratum:
56 to 60 inches, brown, mottled, very firm clay loam

In some places the dark surface layer is more than 7 inches thick. In other places the surface layer is clay loam. In some areas the subsoil has less clay.

Included with this soil in mapping are small areas of the poorly drained Leonard soils. These soils have more clay in the subsoil than the Armstrong soil. They are on head slopes of small drainageways. They make up about 8 percent of the unit.

Important properties of the Armstrong soil—

Permeability: Slow
Organic matter content: Moderate
Available water capacity: Moderate
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Nearly all areas are used for cultivated crops. Some areas are used for pasture or hay, and some small areas are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion and wetness are major management concerns. Row crops should be grown in a rotation dominated by hay or pasture crops. A system of conservation tillage that leaves a protective cover of crop residue on the surface throughout the year, winter cover crops, contour farming, stripcropping, and terraces with suitable outlets help to prevent excessive soil loss, improve tilth and organic matter content, and increase the rate of water infiltration. Shallow surface drains help to remove excess water.

This soil is suited to grasses and legumes for pasture and hay. It is best suited to ladino clover and is moderately well suited to birdsfoot trefoil, tall fescue, timothy, and switchgrass. It is moderately suited to alfalfa and big bluestem. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and the quick establishment of ground cover help to control erosion.

This soil is suited to trees. If the soil is used for timber, seedling mortality is the main management concern. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand.

This soil is suited to building site development and to certain kinds of onsite waste disposal systems. The high shrink-swell potential, the slope, and the wetness are major limitations affecting dwellings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel helps to prevent the structural damage caused by shrinking and swelling of the soil. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Land shaping and retaining walls can modify the slope. Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately, but leveling the lagoon site is necessary.

Low strength, the high shrink-swell potential, the wetness, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action. Some cutting and filling may be necessary to modify the slope.

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

31E2—Armstrong loam, 12 to 18 percent slopes, eroded. This strongly sloping and moderately steep, moderately well drained soil is on side slopes in the uplands. Water erosion has removed some of the original surface soil. Tillage has mixed the remaining surface layer with the upper part of the subsoil. Individual areas of this soil are irregular in shape and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark grayish brown, friable loam

Subsurface layer:
4 to 7 inches, mixed dark brown and reddish brown, friable loam

Subsoil:
7 to 14 inches, reddish brown, mottled, firm clay loam
14 to 30 inches, reddish brown and brown, mottled, firm clay
30 to 50 inches, dark yellowish brown, mottled, firm clay loam

Substratum:
50 to 60 inches, brown, mottled, very firm clay loam

In some areas the dark surface layer is more than 7 inches thick. In other areas the surface layer is clay loam.

Included with this soil in mapping are small areas of Gara and Lindley soils. These soils have less clay in the subsoil than the Armstrong soil. They are on the lower, steeper side slopes. They make up about 5 to 10 percent of the unit.

Important properties of the Armstrong soil—

Permeability: Slow
Organic matter content: Moderate
Available water capacity: Moderate
Surface runoff: Rapid
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are used as pasture. Some areas are used for hay. A few areas are wooded. This soil generally is unsuited to cultivated crops because of the slope, wetness, and the severe hazard of water erosion.

This soil is suited to grasses and legumes for pasture but is poorly suited to hay crops (fig. 9). It is well suited to ladino clover, birdsfoot trefoil, tall fescue, timothy, switchgrass, big bluestem, and indiangrass and is moderately suited to alfalfa and red clover. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent sheet and gully erosion when pastures are seeded. Because of the slope and the severe hazard of erosion, proper grazing management is needed to maintain good plant density. The slope also limits the use of farming equipment if the soil is used as hayland.

This soil is suited to trees. Seedling mortality is the main management concern. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand.

This soil is suitable for building site development and certain kinds of onsite waste disposal systems. The high shrink-swell potential, the wetness, and the slope are the major management concerns. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Land shaping and retaining walls can modify the slope. This soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Lagoons function

Figure 9.—Pasture in an area of Armstrong loam, 12 to 18 percent slopes, eroded.

satisfactorily if the site can be leveled. Also, the effluent can be piped to nearby areas where the soils are suitable for onsite waste disposal.

Low strength, the high shrink-swell potential, the wetness, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage caused by shrinking and swelling, wetness, and frost action. Cutting and filling may be needed to modify the slope.

The land capability classification is VIe. The woodland ordination symbol is 3R.

32F2—Gara loam, 18 to 30 percent slopes, eroded. This steep, moderately well drained soil is on convex side slopes in the uplands. Water erosion has removed some of the original surface soil. Individual areas of this soil are irregular in shape and range from about 10 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 6 inches, very dark grayish brown, friable loam

Subsoil:

6 to 9 inches, dark yellowish brown and dark brown loam

9 to 28 inches, yellowish brown, firm clay loam

28 to 44 inches, strong brown, mottled, firm clay loam

Substratum:

44 to 60 inches, yellowish brown, mottled, firm clay loam

In some places the dark surface layer is less than 6 inches thick. In other places the surface layer is dark yellowish brown clay loam.

Included with this soil in mapping are areas of the somewhat poorly drained Armstrong soils. These soils have more clay in the subsoil than the Gara soil. They are on the less sloping ridgetops and side slopes above the Gara soil. They make up about 10 percent of the unit.

Important properties of the Gara soil—

Permeability: Moderately slow
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Rapid
Shrink-swell potential: Moderate
Depth to the water table: More than 6 feet

Most areas are used for pasture. Some areas along small drainageways are wooded. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It should be tilled only when necessary for reseeding grasses and legumes. The soil is best suited to birdsfoot trefoil, red clover, tall fescue, timothy, and switchgrass. It is moderately well suited to alsike clover, orchardgrass, big bluestem, and indiangrass. The main concern affecting pasture management is water erosion during seedbed preparation. When pastures are seeded, tilling on the contour and planting companion crops or leaving crop residue on the surface help to control erosion. Because of the slope and the severe hazard of erosion, proper grazing management is needed to maintain good plant density.

This soil is suited to trees. The erosion hazard and equipment limitations are the main management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimize the concentration of water. Constructing water breaks and seeding disturbed areas after harvesting is completed may be necessary to control erosion. In severe cases, it may be necessary to yard the logs uphill to logging roads or skid trails.

This soil generally is not used for building site development because of the slope.

The land capability classification is VIe. The woodland ordination symbol is 3R.

33—Edina silt loam. This nearly level, poorly drained soil is on high, broad divides in the uplands. Individual areas are irregular in shape and range from about 100 to 3,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 12 inches, very dark grayish brown, friable silt loam

Subsurface layer:
12 to 20 inches, dark grayish brown, friable silt loam

Subsoil:
20 to 42 inches, very dark gray and dark gray, mottled, firm silty clay
42 to 50 inches, grayish brown, mottled, firm silty clay loam

Substratum:
50 to 60 inches, grayish brown, mottled, firm silty clay loam

In some places the substratum is clay loam. In other places the dark surface layer is less than 10 inches thick.

Important soil properties—

Permeability: Very slow
Organic matter content: Moderate
Available water capacity: Moderate
Surface runoff: Very slow
Shrink-swell potential: Very high
Seasonal high water table: Perched at the surface to 2 feet below the surface

Most areas are used for cultivated crops. A few areas are used for pasture. Corn, soybeans, and winter wheat are the commonly grown crops (fig. 10). Wetness is the main management concern. It can be reduced by shallow surface drains and land grading. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture and hay. Birdsfoot trefoil and switchgrass grow best. The soil is moderately suited to alsike clover, ladino clover, tall fescue, and indiangrass. The main concern affecting pasture management is wetness. The soil generally is not used for deep-rooted legumes, such as alfalfa, because of the wetness and frost heave. A surface drainage system can benefit most grass species. Restricted use during wet periods helps to prevent surface compaction and maintains good plant density.

If this soil is used for building site development, the shrink-swell potential and the wetness are major concerns affecting the construction of dwellings. Dwellings without basements are better suited than those with basements. Damage to dwellings and small commercial buildings caused by the shrinking and swelling of the soil can be minimized by using proper design and construction methods. Constructing footings, foundations, and basement walls with reinforced

Figure 10.—A good crop of soybeans in an area of Edina silt loam.

concrete and backfilling with sand or gravel help to prevent structural damage. Land grading improves surface drainage and thus helps to prevent the damage caused by excessive wetness. Also, drainage tile should be installed around footings and foundations. The grade should be sufficient for a proper outlet for the drain tile. Reinforced concrete, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling of the soil.

This soil is best suited to sewage lagoons. It is unsuited to conventional septic tank absorption fields because of the restricted permeability.

Low strength, the shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Roads should be constructed on raised, well compacted fill material. Constructing roadside ditches and installing culverts for adequate drainage help to prevent the damage caused by shrinking and swelling, wetness, and frost action.

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

35C2—Gorin silt loam, 3 to 9 percent slopes, eroded. This gently sloping and moderately sloping, somewhat poorly drained soil is on convex ridgetops and side slopes in the uplands. Water erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the subsurface layer by tillage. Individual areas of this soil are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 5 inches, dark grayish brown, friable silt loam

Subsoil:
5 to 8 inches, dark yellowish brown, mottled, firm silty clay loam
8 to 22 inches, yellowish brown and brown, mottled, firm silty clay
22 to 42 inches, brown and dark yellowish brown, mottled, firm silty clay loam
42 to 60 inches, yellowish brown, firm loam

In some places the dark surface layer is 7 inches thick or more. In other places the slope is less than 2 percent or more than 9 percent. In some areas the soil contains more silt and less clay throughout.

Included with this soil in mapping are small areas of Bucklick and Lindley soils. These soils are on the steeper side slopes. Bucklick soils contain more clay and rock fragments than the Gorin soil. Lindley soils have less clay throughout than the Gorin soil. Included soils make up about 5 to 10 percent of the unit.

Important properties of the Gorin soil—

Permeability: Slow
Organic matter content: Low
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1.5 to 2.5 feet

Most areas are wooded. A few areas are used for pasture. Some small areas have been cleared and are used as cropland. This soil is suited to trees, and many areas support good stands of native hardwoods. Seedling mortality is the main management concern. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand. Seedlings grow well if competing vegetation is controlled by spraying, cutting, or girdling.

Corn, soybeans, and winter wheat are the commonly grown row crops. If this soil is used for cultivated crops, water erosion and wetness are the major management concerns. A system of conservation tillage that leaves a protective cover of crop residue on the surface throughout the year, winter cover crops, and grassed waterways help to prevent excessive soil loss. Some areas are smooth enough and large enough to be terraced and farmed on the contour. Properly managing crop residue and green manure crops helps to control water erosion, maintains or improves tilth and organic matter content, and increases the rate of water infiltration. Shallow surface drains help to remove excess water.

This soil is suited to grasses and legumes for pasture or hay (fig. 11). It is well suited to ladino clover and moderately well suited to birdsfoot trefoil, tall fescue, timothy, and switchgrass. It is moderately suited to alfalfa. Wetness and water erosion during seedbed preparation are the main concerns affecting pasture management. Timely tillage and the quick establishment of ground cover during seeding reduce the hazard of water erosion. Restricted use during wet periods helps to prevent surface compaction and maintains good plant density.

This soil is suitable for building site development and certain kinds of onsite waste disposal systems. The high shrink-swell potential and the wetness are major concerns affecting the construction of dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling. Installing drainage tile around footings and foundations helps to prevent the damage caused by excessive wetness. Land shaping is needed on sites for small commercial buildings because of the slope. Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling and by frost action. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately. Leveling the lagoon site is necessary.

Low strength, the shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action.

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

37B—Marion silt loam, 1 to 5 percent slopes. This very gently sloping and gently sloping, somewhat poorly drained soil is on narrow ridgetops in the uplands and on the crests of high stream terraces. Individual areas are long and narrow and range from about 10 to 70 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, grayish brown, very friable silt loam

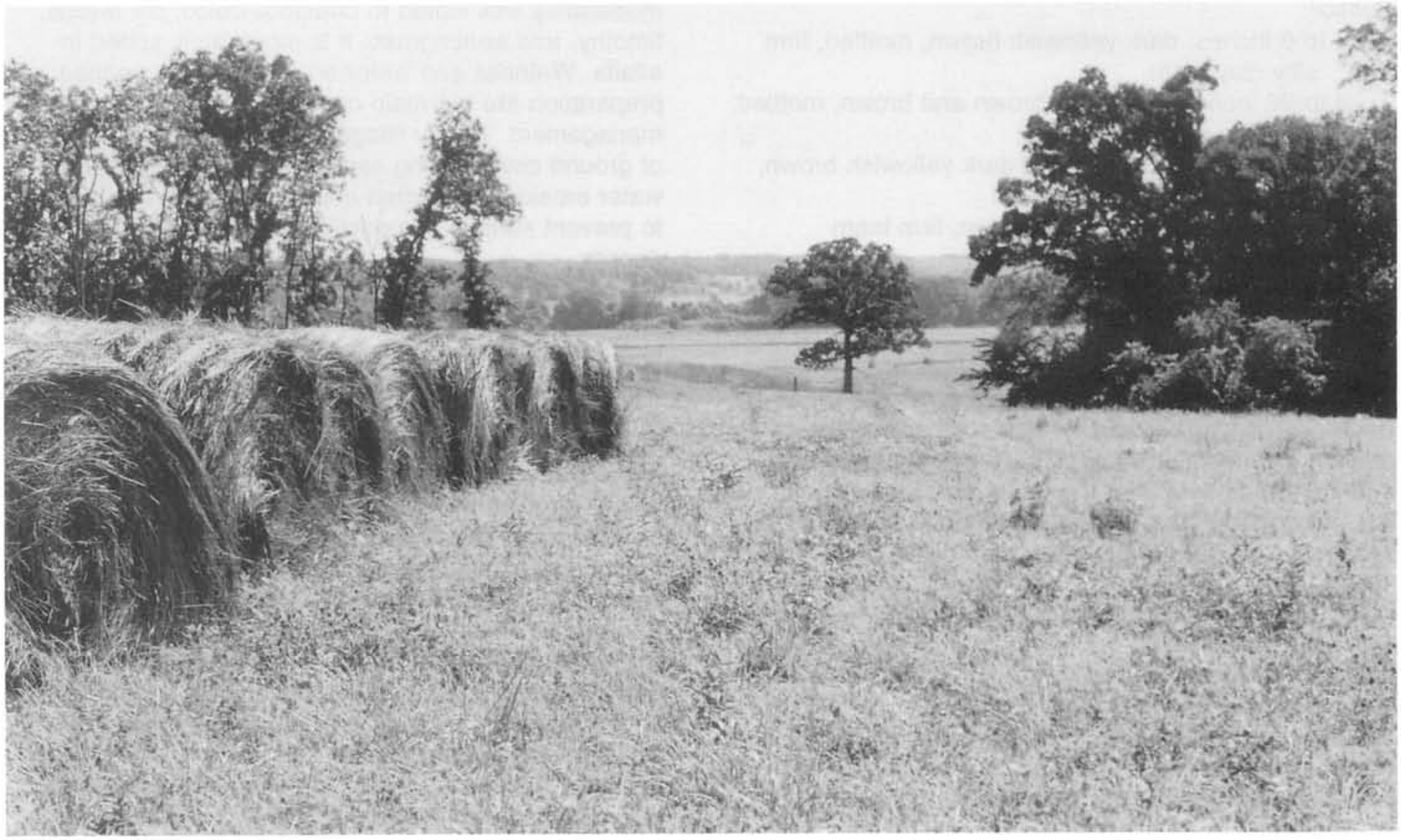

Figure 11.—Large bales of orchardgrass-red clover hay in an area of Gorin silt loam, 3 to 9 percent slopes, eroded.

Subsurface layer:
8 to 13 inches, brown and light brownish gray, friable silt loam

Subsoil:
13 to 27 inches, yellowish brown, mottled, firm silty clay
27 to 52 inches, grayish brown, mottled, very firm silty clay loam

Substratum:
52 to 60 inches, light brownish gray, mottled, firm silt loam

In a few places the soil contains less clay. In some areas the lower part of the subsoil is sandy loam or clay loam.

Important soil properties—

Permeability: Very slow
Organic matter content: Moderately low
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 2 feet

Most areas are used for cultivated crops. Some areas are used for pasture or hay, and a few small areas are wooded. Corn, grain sorghum, soybeans, and winter wheat are the commonly grown crops. Wetness and water erosion are major concerns. Terraces that have proper outlets and contour farming greatly reduce the runoff rate and minimize soil losses. A conservation tillage system that leaves a cover of crop residue on the surface or no-till farming also helps to control erosion. Using crop residue, barnyard manure, and green manure crops maintains or improves tilth and organic matter content and increases the rate of water infiltration. Shallow surface drains help to remove excess water.

This soil is suited to grasses and legumes for pasture or hay. It is well suited to ladino clover and moderately well suited to alsike clover, birdsfoot trefoil, tall fescue, timothy, big bluestem, and indiangrass. The main concerns affecting pasture management are water erosion during seedbed preparation and wetness. Timely tillage and a quickly established ground cover help to prevent excessive water erosion. Restricted use during wet periods helps to prevent surface compaction and maintains good plant density.

This soil is suited to trees. Seedling mortality and the windthrow hazard are the main concerns affecting timber management. Planting container-grown stock or reinforcement planting and ridging the soil and planting on the ridge help to ensure an adequate stand. The stands should be thinned less intensively and more frequently than stands in areas where windthrow is less likely.

This soil is suited to building site development and to some kinds of onsite waste disposal systems. The shrink-swell potential and the wetness are major limitations affecting dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately. Leveling the lagoon site may be necessary.

Low strength, the shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action.

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

39C2—Keswick loam, 5 to 12 percent slopes, eroded. This moderately sloping and strongly sloping, moderately well drained soil is on convex ridgetops and side slopes in the uplands. Water erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the subsurface layer by tillage. Individual areas of this soil are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, dark grayish brown and brown, friable loam

Subsoil:
7 to 16 inches, reddish brown, firm clay loam
16 to 30 inches, reddish brown, mottled, firm clay
30 to 46 inches, brown, mottled, firm clay loam

Substratum:
46 to 60 inches, yellowish brown, mottled firm clay loam

In some places the surface layer is very dark grayish brown loam. In other places it is brown and reddish brown clay loam. In some areas the soil is silty or clayey throughout.

Included with this soil in mapping are small areas of the poorly drained Leonard soils. These soils have more clay than the Keswick soil and have a darker surface layer. They are on head slopes of drainageways above the Keswick soil. They make up about 12 percent of the unit.

Important properties of the Keswick soil—

Permeability: Slow
Organic matter content: Low
Available water capacity: Moderate
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are wooded. Some areas are used for cultivated crops or for pasture and hay. This soil is suited to trees. Seedling mortality is the main management concern. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand.

Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is a major management concern. A system of conservation tillage that leaves a protective cover of crop residue on the surface throughout the year, winter cover crops, contour farming, stripcropping, and terraces with suitable outlets help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves tilth and increases the rate of water infiltration. Shallow surface drains help to remove excess water in areas where wetness is a concern.

This soil is suited to grasses and legumes for pasture and hay. It is well suited to ladino clover in pasture-grass mixtures. It is moderately well suited to birdsfoot trefoil, tall fescue, timothy, and switchgrass and moderately suited to alfalfa and little bluestem. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and the quick establishment of ground cover help to control erosion.

This soil is suitable for building site development and for certain kinds of onsite waste disposal systems. The high shrink-swell potential, the wetness, and the slope are major limitations affecting the construction of dwellings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Land shaping may be necessary to modify the slope, or the dwellings can be designed to conform to the natural landscape. Adequate reinforced steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling and by low strength. The soil is unsuitable for conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately. Leveling the lagoon site is necessary.

Low strength, the high shrink-swell potential, the wetness, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action. Some cutting and filling may be necessary to modify the slope.

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

39E2—Keswick loam, 12 to 18 percent slopes, eroded. This strongly sloping and moderately steep, moderately well drained soil is on convex side slopes in the uplands. Water erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the subsurface layer by tillage. Individual areas of this soil are irregular in shape and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, dark grayish brown, friable loam

Subsurface layer:
6 to 9 inches, brown, firm loam

Subsoil:
9 to 28 inches, brown, strong brown, and dark yellowish brown, mottled, firm clay
28 to 45 inches, brown and dark yellowish brown, mottled, firm clay loam

Substratum:
45 to 60 inches, dark yellowish brown, mottled, firm clay loam

In some places the surface layer is very dark grayish brown loam. In other places it is brown or reddish brown clay loam. In some areas the soil does not have glacial sand or gravel in the profile.

Included with this soil in mapping are small severely eroded areas where the surface layer is clay loam and soils on small breaks that have slopes of more than 18 percent. Also included are areas of Lindley soils on the steeper side slopes. Lindley soils are less clayey than the Keswick soil. Included areas make up about 8 percent of the unit.

Important properties of the Keswick soil—

Permeability: Slow
Organic matter content: Low
Available water capacity: Moderate
Surface runoff: Rapid
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are wooded. Some areas are used for pasture and hay. This soil generally is unsuited to cultivated crops because of the severe hazard of erosion. The use of some kinds of equipment is hazardous because of the slope. The soil is suited to trees. The erosion hazard, equipment limitations, and seedling mortality are the main management concerns. Logging trails should be laid out on the contour. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible. Constructing water breaks helps to control erosion on skid trails and logging roads. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand.

This soil is poorly suited to grasses and legumes for pasture and hay. Water erosion and the slope are major concerns. Once established, however, a cover of grasses and legumes is effective in controlling water erosion. The soil is well suited to ladino clover in pasture-grass mixtures. It is moderately well suited to birdsfoot trefoil, tall fescue, timothy, and switchgrass. The main concern affecting pasture management is water erosion during seedbed preparation. Tilling on the contour in a timely manner, planting companion crops, and leaving crop residue on the surface during seeding help to ensure an adequate ground cover and thus help to control erosion. Because of the slope and the severe hazard of erosion, proper grazing management is needed to maintain good plant density.

This soil is suitable for building site development and for certain kinds of onsite waste disposal systems. The shrink-swell potential, the wetness, and the slope are major limitations affecting the construction of dwellings with or without basements. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Dwellings can be designed so that they conform to the natural landscape, or the site can be altered by land shaping. Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling and by frost action. The soil is unsuited to conventional septic tank absorption fields because of the wetness and the restricted permeability. Properly designed sewage lagoons can function adequately if the area can be leveled.

Low strength, the shrink-swell potential, the wetness, the potential for frost action, and the slope limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by wetness. Cutting and filling may be needed to modify the slope.

The land capability classification is VIe. The woodland ordination symbol is 3R.

41C2—Leonard silty clay loam, 3 to 9 percent slopes, eroded. This gently sloping and moderately sloping, poorly drained soil is on convex ridgetops and on head slopes of drainageways in the uplands. Water erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the upper part of the subsoil by tillage. Individual areas of this soil are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, very dark grayish brown, friable silty clay loam

Subsoil:
6 to 10 inches, dark grayish brown, mottled, firm silty clay
10 to 55 inches, grayish brown and gray, mottled, firm clay

Substratum:
55 to 60 inches, gray, mottled, firm clay

In places the dark surface layer is less than 6 inches in thickness. In some areas the subsoil contains less clay. In other areas the soil is not as gray.

Included with this soil in mapping are small areas of the somewhat poorly drained Adco and Armstrong soils and the moderately well drained Keswick soils. These soils are less gray than the Leonard soil. Adco soils have less clay in the upper part of the subsoil than the Leonard soil. They are on ridges above the Leonard soil. Armstrong and Keswick soils have much more glacial sand and pebbles throughout than the Leonard soil. They are on the steeper side slopes below the Leonard soil. Included soils make up about 10 percent of the unit.

Important properties of the Leonard soil—

Permeability: Slow
Organic matter content: Moderately low
Available water capacity: Moderate
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet

Nearly all areas are used for cultivated crops. Some areas are used for pasture and hay. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is a severe hazard if cultivated crops are grown. Wetness is also a concern. A system of conservation tillage that leaves a protective cover of crop residue on the surface throughout the year, winter cover crops, contour farming, stripcropping, and terraces with suitable outlets help to minimize soil losses. Returning crop residue to the soil or regularly adding other organic material improves tilth and increases the rate of water infiltration. In some years wetness can delay tillage in early spring. Shallow surface drains help to remove excess water.

This soil is suited to grasses and legumes for pasture. It is best suited to wetness-tolerant, shallow-rooted species. It is moderately well suited to switchgrass and moderately suited to birdsfoot trefoil, tall fescue, bermudagrass, and indiangrass. The main concerns affecting pasture management are water erosion during seedbed preparation and the wetness. Timely tillage and a quickly established ground cover help to control erosion. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is suitable for building site development and for certain kinds of onsite waste disposal systems. The high shrink-swell potential and the wetness are limitations on sites for dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Land shaping is necessary on sites for small commercial buildings because of the slope. Adequate reinforcement steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can function adequately. Leveling the lagoon site is necessary.

Low strength, the high shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action.

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

43B—Adco silt loam, 1 to 5 percent slopes. This very gently sloping and gently sloping, somewhat poorly drained soil is on wide ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark grayish brown, friable silt loam

Subsurface layer:
8 to 14 inches, grayish brown, friable silt loam

Subsoil:
14 to 33 inches, dark grayish brown, dark brown, and yellowish brown, mottled, firm and very firm silty clay
33 to 60 inches, grayish brown and light brownish gray, mottled, firm silty clay loam

Included with this soil in mapping are areas of the poorly drained Belinda, Edina, and Leonard soils. Belinda soils have less clay throughout than the Adco soil. Edina soils have a thicker dark surface layer than the Adco soil. They are on broad flats. Leonard soils have more clay in the lower part of the subsoil than the Adco soil. They are on the steeper side slopes and head slopes. Included soils make up 3 to 9 percent of the unit.

Important properties of the Adco soil—

Permeability: Very slow
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Medium
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1.0 to 2.5 feet

Most areas are used for cultivated crops. A few small areas are used for pasture and hay. Corn, grain sorghum, soybeans, and winter wheat are the commonly grown crops (fig. 12). Water erosion and wetness are the main management concerns. Erosion can be minimized by a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves a protective cover of crop residue on the surface, contour farming, terraces and grassed waterways, or a combination of these. In some areas, shallow surface ditches and land grading help to remove excess water. Using crop residue, barnyard manure, and green manure crops maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to ladino clover, alsike clover, birdsfoot trefoil, tall fescue, timothy, big bluestem, and indiangrass. It is unsuited to alfalfa, however, because of the wetness and frost heave. The main concerns affecting pasture management are water erosion during seedbed preparation and wetness. Timely tillage and the quick establishment of ground cover help to control erosion. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is suited to building site development and to some kinds of onsite waste disposal systems. The high shrink-swell potential and wetness are major limitations affecting the construction of dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. The soil is unsuited to conventional septic tank absorption fields because of the restricted permeability. Properly designed sewage lagoons can

Figure 12.—Winter wheat stubble in an area of Adco silt loam, 1 to 5 percent slopes.

function adequately. Leveling the lagoon site may be necessary.

Low strength, the high shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling, wetness, and frost action.

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

44—Belinda silt loam. This nearly level, poorly drained soil is on high, broad divides in the uplands. Individual areas are irregular in shape and range from about 5 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, friable silt loam

Subsurface layer:
8 to 16 inches, gray, friable silt loam

Subsoil:
16 to 31 inches, dark gray, mottled, firm silty clay
31 to 60 inches, light brownish gray, mottled, firm silty clay loam

In places the subsoil contains more clay.

Important soil properties—

Permeability: Very slow
Organic matter content: Moderate

Available water capacity: Moderate
Surface runoff: Very slow
Shrink-swell potential: High
Depth to the water table: 0.5 foot to 2.0 feet

Most areas are used for cultivated crops. Only a few small areas are used for pasture. Corn, soybeans, and winter wheat are the commonly grown crops. Wetness is the main management concern. It can be reduced by constructing shallow surface ditches or land grading or by a combination of these. Using a system of conservation tillage that leaves all or part of the crop residue on the surface and planting cover crops maintain or improve tilth and organic matter content and increase the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to birdsfoot trefoil and switchgrass and moderately suited to alsike clover, ladino clover, tall fescue, and indiangrass. Wetness and frost heave are the main management concerns. Wetness can be reduced by constructing shallow surface ditches or by grading the land. Grass species that are less susceptible to frost heave should be selected. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is well suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are the main management concerns. Equipment should be operated only when the soil is relatively dry or frozen. Ridging the soil and planting seedlings on the ridges improve the seedling survival rate. The stands should be thinned less intensively and more frequently than stands in areas where windthrow is less likely.

This soil is suitable for building site development and for some kinds of onsite waste disposal systems. The shrink-swell potential and the wetness are major limitations affecting the construction of dwellings and small commercial buildings. Constructing footings, foundations, and basement walls with reinforced concrete and backfilling with sand or gravel help to prevent the damage caused by shrinking and swelling of the soil. Land shaping improves surface drainage. Installing drainage tile around footings and foundations helps to prevent the damage caused by excessive wetness. Reinforced concrete, expansion joints, and a sand and gravel base for sidewalks and driveways help to prevent the damage caused by the shrinking and swelling of the soil.

This soil is suited to properly constructed sewage lagoons. It is not suited to conventional septic tank absorption fields because of the restricted permeability.

Low strength, the shrink-swell potential, the wetness, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage caused by shrinking and swelling, wetness, and frost action.

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

45F—Bucklick silt loam, 18 to 35 percent slopes. This steep, well drained soil is on the ends of ridgetops and side slopes in the uplands. Individual areas occur in a dendritic pattern and range from 25 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, dark yellowish brown, friable silt loam

Subsurface layer:
6 to 10 inches, brown, friable silt loam

Subsoil:
10 to 40 inches, red, firm clay loam

Substratum:
40 to 46 inches, yellowish red, firm clay loam

Bedrock:
46 inches, hard limestone

In some places bedrock is at a depth of more than 60 inches. In other places it is at a depth of less than 40 inches. In some areas the substratum is mostly glacial material containing gravel and cobbles. In other areas the surface layer is loamy sand or sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Gorin soils on narrow ridgetops and side slopes and areas of soils that are less than 20 inches deep over bedrock. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the unit.

Important properties of the Bucklick soil—

Permeability: Moderate
Organic matter content: Moderately low
Available water capacity: Moderate
Surface runoff: Rapid
Shrink-swell potential: High
Depth to the water table: More than 6 feet
Depth to bedrock: 40 to 60 inches

Most areas are wooded. Some small areas are used as pasture. A few areas are idle land. This soil is unsuited to cultivated crops because of the slope and the severe hazard of erosion.

This soil is best suited to trees. The erosion hazard and equipment limitations are major management concerns. Where possible, logging roads and skid trails should be established on the contour. Water breaks help to control erosion. Reseeding of disturbed areas may be needed after any logging activities.

This soil is poorly suited to grasses and legumes for pasture because of the slope. In the areas that are used as pasture, restricting grazing helps to maintain good plant density and thus helps to control erosion.

This soil generally is not used for building site development or for most kinds of onsite waste disposal systems because of the slope.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

47C2—Winfield silt loam, 5 to 12 percent slopes, eroded. This moderately sloping and strongly sloping, moderately well drained soil is on convex ridgetops and on side slopes in the uplands. Water erosion has removed some of the original surface soil. The remaining surface layer has been mixed with the subsurface layer by tillage. Individual areas of this soil are irregular in shape and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, dark grayish brown, friable silt loam

Subsoil:
8 to 20 inches, yellowish brown, friable silt loam and silty clay loam
20 to 52 inches, yellowish brown, mottled, firm silty clay loam and silt loam

Substratum:
52 to 60 inches, yellowish brown, mottled, firm silt loam

In places the soil is redder throughout. In a few areas the substratum has glacial sand and gravel. In some places the subsoil contains more clay. In other places the surface layer is yellowish brown silty clay loam.

Important soil properties—

Permeability: Moderate
Organic matter content: Low
Available water capacity: Very high
Surface runoff: Medium
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 2.5 to 4.0 feet

Most areas are used for cultivated crops. Some small areas are used for pasture or hay or are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is a major hazard. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and stripcropping help to control water erosion. Some areas are smooth enough and large enough to be terraced and farmed on the contour. Proper management of crop residue and green manure crops maintains or improves tilth and organic matter content and increases the rate of water infiltration. In areas where wetness is a concern, shallow surface drains help to remove excess water.

This soil is suited to grasses and legumes for pasture or hay. It is well suited to red clover, tall fescue, timothy, bermudagrass, big bluestem, indiangrass, and other commonly grown legumes and warm- and cool-season grasses. The main concern affecting pasture management is water erosion during seedbed preparation. Timely tillage and the quick establishment of ground cover help to control erosion.

This soil is suited to trees. No major soil problems affect timber management.

This soil is suitable for building site development and for some kinds of onsite waste disposal systems. The shrink-swell potential, the wetness, and the slope are the main limitations affecting the construction of dwellings. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Installing drainage tile around the footings helps to prevent the damage caused by excessive wetness. Adequately reinforced steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by shrinking and swelling. The soil is suitable for properly designed and installed septic tank absorption fields. Sewage lagoons also function adequately. Leveling the lagoon site may be necessary. Sealing the bottom and sides of the lagoon also may be needed to minimize seepage.

Low strength, the shrink-swell potential, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by shrinking and swelling and by frost action.

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

48C—Alvin fine sandy loam, 3 to 9 percent slopes. This gently sloping and moderately sloping, well drained soil is on high stream terraces. Individual areas are irregular in shape and range from about 5 to 20 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, dark brown, very friable fine sandy loam

Subsurface layer:
7 to 15 inches, dark brown, very friable fine sandy loam

Subsoil:
15 to 36 inches, brown, firm fine sandy loam

Substratum:
36 to 60 inches, brown, loose loamy sand and strong brown, very friable sandy loam

In some places the soil contains less clay in the subsoil. In other places the surface layer is very dark gray loamy fine sand. In some areas the substratum is very coarse sand.

Included with this soil in mapping are small areas of Gilford soils. These soils are poorly drained and are in the lower areas. They make up about 3 percent of the unit.

Important properties of the Alvin soil—

Permeability: Moderately rapid
Organic matter content: Very low
Available water capacity: Moderate
Surface runoff: Medium
Shrink-swell potential: Low
Depth to the water table: More than 6 feet

Most areas are used for cultivated crops. Corn, soybeans, and winter wheat are the commonly grown crops. Water erosion is a major hazard. A system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, and contour farming help to control water erosion. Returning crop residue to the soil improves tilth and organic matter content and increases the rate of water infiltration. Most areas are too small or narrow to be managed individually, but they can be included with adjacent soils in conservation tillage systems and for contour farming.

This soil is suited to grasses and legumes for pasture or hay. It is well suited to ladino clover and moderately well suited to birdsfoot trefoil, tall fescue, timothy, switchgrass, and indiangrass. The main concerns affecting pasture management are water erosion and soil blowing during seedbed preparation. Timely tillage and the quick establishment of ground cover help to control erosion.

This soil is suited to trees. No major soil problems affect timber management.

This soil is suitable for building site development. No major concerns affect the construction of dwellings. Adequately reinforced steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by frost action. The soil is suited to properly constructed septic tank absorption fields. Seepage and the slope are limitations on sites for lagoons. Properly designed and constructed sewage lagoons can function adequately if the site can be leveled. Sealing the bottom and berms of the lagoon helps to prevent seepage and the possible contamination of ground water.

Low strength and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by frost action.

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

49—Vesser silt loam, occasionally flooded. This nearly level, poorly drained soil is on the higher flood plains and alluvial fans. It is flooded for brief periods. Individual areas are irregular in shape and range from about 10 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark grayish brown, friable silt loam

Subsurface layer:
8 to 24 inches, very dark grayish brown and dark gray, mottled, friable silt loam

Subsoil:
24 to 60 inches, gray and dark gray, mottled, firm silty clay loam

In some areas the dark upper layers are less than 10 inches thick. In other areas the subsoil is silt loam. In places the subsoil has more clay.

Included with this soil in mapping are small areas of the moderately well drained Klum soils. These soils have much more sand throughout than the Vesser soil. They are in the higher raised areas closer to the stream channels than the Vesser soil. They make up about 8 percent of the unit.

Important properties of the Vesser soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1.5 feet below the surface

Most areas are used for cultivated crops. Some areas are used for pasture. Corn, soybeans, and winter wheat are commonly grown crops. Wetness and flooding are the main management concerns. The wetness can be reduced by using shallow surface ditches and by grading the land. The flooding delays planting and interferes with harvesting in some years. Crop damage can also be expected in some years. In areas where this soil is adjacent to uplands, constructing diversions provides protection from upland runoff. Returning crop residue to the soil maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture. It is best suited to wetness-tolerant, shallow-rooted species. Alsike clover and birdsfoot trefoil grow best. Timothy and tall fescue are the best suited cool-season grasses. The soil is poorly suited to hay production because of the flooding. The main concerns affecting pasture management are the wetness and the flooding. A surface drainage system benefits most grass species. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

Because of the occasional flooding, this soil is unsuitable for building site development and for all types of onsite waste disposal systems.

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

50—Pits, quarries. This map unit consists mainly of open excavations from which sand, gravel, and limestone have been removed for private or commercial use. Some pits are shallow, and others are as much as 50 feet deep. Some contain water. Areas of this unit are commonly along the leading edge of uplands and broad stream terraces. They range from 10 to 150 acres in size.

Typically, the soil material has been removed and bedrock, sand, and gravel are exposed. Soil material has washed into some pits, and sparse vegetation has emerged. In some places the gravel deposits are only a few feet thick over glacial till or bedrock. In other places the limestone pits have a thick overburden.

Included in mapping are small areas where the overburden has been piled. These areas support a cover of vegetation. Also included are areas where water covers the lower part of the pits.

Abandoned pits have little or no value for crops or pasture. They are suited to wildlife habitat and recreational uses, especially if they contain water deep enough for fish. The pits that contain water are excellent watering places for deer and other wildlife.

No land capability classification or woodland ordination symbol is assigned.

51—Gilford sandy loam, occasionally flooded. This nearly level, poorly drained soil is in low areas on broad flood plains. It is subject to flooding and ponding for brief periods. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark gray, very friable sandy loam

Subsurface layer:
7 to 15 inches, black, friable sandy loam

Subsoil:
15 to 20 inches, dark gray, mottled, friable sandy loam
20 to 49 inches, gray and light brownish gray, mottled, friable sandy loam

Substratum:
49 to 60 inches, light brownish gray, mottled, friable loamy sand

Included with this soil in mapping are small areas of Alvin, Hoopeston, and Perks soils. These soils have browner colors in the subsoil and substratum than the Gilford soil. They are in positions on the landscape slightly higher than those of the Gilford soil. They make up 9 to 12 percent of the unit.

Important properties of the Gilford soil—

Permeability: Moderately rapid in the upper part, rapid in the lower part
Organic matter content: Moderate
Available water capacity: Moderate
Surface runoff: Slow
Shrink-swell potential: Low
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface

Most areas are used for cultivated crops. Some small areas are used for pasture. Corn, soybeans, and winter wheat are the commonly grown crops. Wetness and flooding are the main management concerns. The wetness can be reduced by constructing shallow surface ditches or by grading the land. A suitable drainage system is difficult to establish in some small areas because adequate outlets are not available. The flooding delays planting and interferes with harvesting in some years. Also, crop damage can be expected in some years. Using a system of conservation tillage that leaves all or part of the crop residue on the surface and planting cover crops maintain or improve tilth and organic matter content and increase the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay crops. The main concerns affecting pasture management are the wetness and the flooding. The soil is poorly suited to alfalfa because of the wetness and frost heave. Surface drainage benefits most grass species. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is suited to trees. Only a few areas support timber. Equipment limitations, seedling mortality, and the windthrow hazard are the main management concerns. Equipment should be used only during the dry season or when the ground is frozen. Planting seedlings on ridges increases the seedling survival rate. The stands should be thinned less intensively and more frequently than stands in areas where windthrow is less likely.

This soil is unsuited to building site development and onsite waste disposal systems because of the occasional flooding.

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

53—Vesser silt loam, frequently flooded. This nearly level, poorly drained soil is on flood plains and alluvial fans. It is flooded for brief periods. Individual areas are irregular in shape and range from about 10 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 11 inches, very dark grayish brown, friable silt loam

Subsurface layer:
11 to 31 inches, dark grayish brown and grayish brown, mottled, friable silt loam

Subsoil:
31 to 60 inches, grayish brown, mottled, firm silty clay loam

In some areas the dark surface layer is less than 10 inches thick. In other areas the subsoil is silt loam. In places the subsoil has more clay.

Included with this soil in mapping are small areas of the moderately well drained Klum soils. These soils have much more sand throughout than the Vesser soil. They are in the higher raised areas closer to the stream channels than the Vesser soil. They make up about 8 percent of the unit.

Important properties of the Vesser soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1.5 feet below the surface

Most areas are used for cultivated crops. Some areas are used for pasture. Corn, soybeans, and winter wheat are the commonly grown crops. Wetness and flooding are the main management concerns. The flooding delays planting and interferes with harvesting in some years. Some crop damage can be expected about 50 percent of the time, and major damage can be expected about 20 percent of the time. The wetness can be reduced by installing shallow surface ditches and by grading the land. In areas where this soil is adjacent to uplands, diversions can provide protection from upland runoff. Returning crop residue to the soil maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture. It is suited to wetness-tolerant, shallow-rooted species. Alsike clover and birdsfoot trefoil grow best. Timothy and tall fescue are the best suited cool-season grasses. The main concerns affecting pasture management are the flooding and the wetness. Surface drainage benefits most grass species. The soil is poorly suited to hay production because of the flooding. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

Because of the frequent flooding, this soil is unsuitable for building site development and all types of onsite waste disposal systems.

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

54—Zook silty clay loam, frequently flooded. This nearly level, poorly drained soil is in low areas on broad flood plains. It is flooded for brief periods. Individual areas are irregular in shape and range from about 10 to 500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, black, firm silty clay loam

Subsurface layer:
9 to 36 inches, black, firm silty clay loam

Subsoil:
36 to 49 inches, black, firm silty clay loam
49 to 60 inches, black, mottled, firm silty clay loam

In some places the surface layer is dark grayish brown silt loam. In other places the subsoil contains less clay.

Included with this soil in mapping are some small areas of the well drained Huntsville soils. These soils have less clay and more silt throughout than the Zook soil. They are in slightly raised areas closer to the stream channel than the Zook soil. They make up about 10 percent of the unit.

Important properties of the Zook soil—

Permeability: Slow
Organic matter content: High
Available water capacity: High
Surface runoff: Very slow
Shrink-swell potential: High
Seasonal high water table: At the surface to 2 feet below the surface

Most areas are used for cultivated crops. Some areas are used for pasture. A few small areas adjacent to open ditches and small streams are wooded. Corn and soybeans are the commonly grown crops. Flooding and wetness are major management concerns. Planting and harvesting may be delayed in some years. Some crop damage can be expected about 50 percent of the time, and major damage can be expected about 20 percent of the time. The wetness can be reduced by constructing shallow surface ditches and by grading the land. Using a system of conservation tillage that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture. It is best suited to wetness-tolerant, shallow-rooted species. It is moderately suited to birdsfoot trefoil, ladino clover, red clover, tall fescue, and timothy. The flooding and the wetness are major concerns affecting pasture management. Shallow surface ditches or land grading improves surface drainage. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is unsuitable for building site development and for most types of onsite waste disposal systems because of the frequent flooding.

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

60—Excello clay loam, occasionally flooded. This nearly level, poorly drained soil is on flood plains. It is protected from low-level flooding by levees, but it is subject to flooding when major floods occur. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Individual areas of this soil are irregular in shape and range from about 10 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, black, friable clay loam

Subsurface layer:
6 to 14 inches, black, friable clay loam

Subsoil:
14 to 31 inches, very dark gray, mottled, friable sandy clay loam
31 to 41 inches, dark gray, mottled, friable loam

Substratum:
41 to 60 inches, dark gray, friable sandy clay loam

Included with this soil in mapping are small areas of the poorly drained Gilford soils. These soils have less clay throughout than the Excello soil. Also, they are commonly closer to the major stream channel. They make up about 5 to 10 percent of the unit.

Important properties of the Excello soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1.5 feet below the surface

Most areas are used for cultivated crops. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding and wetness are the main management concerns. Areas of this soil are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. The wetness can be reduced by shallow surface ditches or land grading. Planting and harvesting may be delayed in some years. Some crop damage can be expected. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is best suited to wetness-tolerant species, such as alsike clover and birdsfoot trefoil. Timothy and tall fescue are the best suited cool-season grasses. The main concerns affecting pasture management are the wetness and the flooding. Surface drainage benefits the deeper rooted plant species. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is unsuitable for building site development and for most types of onsite waste disposal systems because of the occasional flooding.

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

66—Nodaway silt loam, occasionally flooded. This nearly level, well drained soil typically is on low levees adjacent to the stream channels on flood plains. It is protected from low-level flooding by levees, but it is subject to flooding when major floods occur. Also, seepage through levees causes partial flooding in some areas during extended periods of high water. Individual areas of this soil are long and narrow and range from 20 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark gray, friable silt loam

Substratum:
7 to 60 inches, very dark grayish brown, friable silt loam that has thin layers of dark grayish brown silt loam

In some areas the soil does not have thin layers of dark grayish brown material.

Included with this soil in mapping are small areas of Colo, Perks, and Zook soils. The poorly drained Colo and Zook soils have more clay throughout than the Nodaway soil. They are in the slightly lower areas. The well drained Perks soils are in landscape positions similar to those of the Nodaway soil. They have more sand than the Nodaway soil. Included soils make up about 10 percent of the unit.

Important properties of the Nodaway soil—

Permeability: Moderate
Organic matter: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Depth to the water table: 3 to 5 feet

Nearly all areas are used for cultivated crops. Only a few small areas adjacent to stream channels are wooded. The commonly grown crops are corn, soybeans, and winter wheat. Flooding is the main management concern. Areas of this soil are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. The soil is well suited to intensive row cropping. Planting and harvesting may be delayed in some years. Some crop damage can be expected. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to tall fescue, little bluestem, and alfalfa. The main concern affecting pasture management is the occasional flooding. Restricted grazing after periods of flooding helps to prevent surface compaction and maintains good plant density.

This soil is suited to trees. No major soil problems affect timber management.

This soil is unsuited to building site development and to most types of onsite waste disposal systems because of the occasional flooding.

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

71—Beaucoup silt loam, occasionally flooded. This nearly level, poorly drained soil is in low backswamp areas on flood plains. It is protected from low-level flooding by levees, but it is subject to flooding for brief or long periods when major floods occur. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Individual areas of this soil are irregular in shape and range from about 10 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, very dark grayish brown, friable silt loam

Subsurface layer:
6 to 21 inches, very dark grayish brown and very dark gray, mottled, friable silt loam

Subsoil:
21 to 60 inches, very dark gray and dark gray, mottled, firm silty clay loam

Included with this soil in mapping are small areas of Huntsville and Zook soils. The well drained Huntsville soils have less clay throughout than the Beaucoup soil. Also, they are closer to the major stream channel. Zook soils have more clay throughout than the Beaucoup soil.

They are in the lower areas. Included soils make up about 5 to 10 percent of the unit.

Important properties of the Beaucoup soil—

Permeability: Moderately slow
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1 foot below the surface

Most areas are used for cultivated crops. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding and wetness are the main management concerns. Areas of this soil are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. Planting and harvesting may be delayed in some years. Some crop damage can be expected. The wetness can be reduced by constructing shallow surface ditches and by grading the land. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is best suited to wetness-tolerant species, such as alsike clover and reed canarygrass. The main concerns affecting pasture management are the wetness and the flooding. Surface drainage benefits the deeper rooted plant species. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is unsuitable for building site development and for most types of onsite waste disposal systems because of the occasional flooding.

The land capability classification is IIw. The woodland ordination symbol is 5W.

74—Orion silt loam, occasionally flooded. This nearly level, somewhat poorly drained soil is in broad, low areas on the flood plains. It is protected from low-level flooding by levees, but it is subject to flooding for very brief or brief periods when major floods occur. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Most areas of this soil are oval or oblong and range from 10 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark grayish brown, friable silt loam

Substratum:
5 to 32 inches, dark grayish brown, mottled, firm silt loam
32 to 60 inches, very dark gray, mottled, firm silty clay loam

Included with this soil in mapping are small areas of Colo, Perks, and Zook soils. The poorly drained Colo and Zook soils have more clay throughout than the Orion soil. They are in the lower areas. The well drained Perks soils are more sandy than the Orion soil. They are in higher positions on the landscape than the Orion soil. Included soils make up about 7 percent of the unit.

Important properties of the Orion soil—

Permeability: Moderate
Organic matter content: Moderately low
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Low
Depth to the water table: 1 to 3 feet

Nearly all areas are used for cultivated crops. Only a few small areas adjacent to stream channels are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding and wetness are the main management concerns. Areas of this soil are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. Planting and harvesting may be delayed in some years. The wetness can be reduced by constructing shallow surface ditches and by grading the land. The soil is well suited to intensive row cropping. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to tall fescue, little bluestem, and red clover. The main concerns affecting pasture management are the flooding and the wetness. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is suited to trees. No major soil problems affect woodland management.

This soil is unsuitable for building site development and for most kinds of onsite waste disposal systems because of the occasional flooding.

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

82—Lawson silt loam, occasionally flooded. This nearly level, somewhat poorly drained soil is in broad, low areas on the flood plains. It is protected from low-level flooding by levees, but it is subject to flooding for brief or long periods when major floods occur. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Most areas of this soil are oval or oblong and range from 10 to 450 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark gray, friable silt loam

Subsurface layer:
10 to 36 inches, very dark gray and very dark grayish brown, mottled, friable silt loam

Substratum:
36 to 60 inches, grayish brown, mottled, friable silt loam

Included with this soil in mapping are small areas of Colo, Perks, and Zook soils. The poorly drained Colo and Zook soils have more clay throughout than the Lawson soil. They are in the lower areas. The well drained Perks soils have more sand than the Lawson soil. They are in higher positions on the landscape than the Lawson soil. Included soils make up about 7 percent of the unit.

Important properties of the Lawson soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: Very high
Surface runoff: Slow
Shrink-swell potential: Moderate
Depth to the water table: 1 to 3 feet

Most areas are used for cultivated crops. Only a few small areas adjacent to stream channels are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. Flooding and wetness are the main management concerns. Areas of this soil are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. The wetness can be reduced by constructing shallow surface ditches and by grading the land. The soil is well suited to intensive row cropping. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is suited to grasses and legumes for pasture or hay. It is moderately well suited to tall fescue, big bluestem, and alfalfa. The main concerns affecting pasture management are the wetness and the flooding. Proper grazing management and restricted use during wet periods help to prevent surface compaction and maintain good plant density.

This soil is suited to trees. No major soil problems affect woodland management.

This soil is unsuitable for building site development and for most kinds of onsite waste disposal systems because of the occasional flooding.

The land capability classification is IIw. The woodland ordination symbol is 2A.

90—Perks loamy sand, occasionally flooded. This nearly level, excessively drained soil is in slightly raised areas on the flood plains. It is protected from low-level flooding by levees, but it is subject to flooding for brief periods when major floods occur. Also, seepage through the levees causes partial flooding in some areas during extended periods of high water. Most areas of this soil are oval or oblong and range from 30 to 1,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, very dark gray, friable loamy sand

Subsurface layer:
9 to 18 inches, very dark grayish brown, friable loamy sand

Substratum:
18 to 36 inches, dark brown and dark yellowish brown, friable loamy fine sand
36 to 48 inches, brown, mottled, friable loamy sand
48 to 60 inches, light brown, loose sand

Included with this soil in mapping are small areas of Gilford and Huntsville soils. Gilford soils have more clay in the subsoil than the Perks soil. They are in the slightly lower areas. Huntsville soils have more silt throughout than the Perks soil. They are in landscape positions similar to those of the Perks soil. Included soils make up about 5 to 10 percent of the unit.

Important properties of the Perks soil—

Permeability: Rapid
Organic matter content: Very low
Available water capacity: Very low
Surface runoff: Slow
Shrink-swell potential: Low
Depth to the water table: More than 6 feet

Most areas are used for cultivated crops. A few areas are wooded, and some areas are idle land. This soil is suited to melons, corn, soybeans, and small grain. Small grain crops are grown mostly in the higher areas where flooding is less likely. Flooding, droughtiness, and soil blowing are the main management concerns.

Most areas are protected by levees, but seepage through the levees during long periods of high water in spring causes flooding in some of the lower areas. Sprinkler systems are used to irrigate many areas, and crop yields have increased appreciably. During years of below average rainfall or poor distribution of rainfall, crops are subject to damage from drought in nonirrigated areas. Using a system of conservation tillage that leaves all or part of the crop residue on the surface and planting winter cover crops maintain or improve tilth and organic matter content.

This soil is suited to grasses and legumes for pasture or hay. Tall fescue, big bluestem, indiangrass, and switchgrass grow best. The soil is moderately well suited to alfalfa, birdsfoot trefoil, ladino clover, and timothy. The main concerns affecting pasture management are the flooding and droughtiness. Restricted use during wet periods helps to maintain good plant density.

This soil is well suited to trees. Seedling mortality is a management concern. Planting container-grown stock or reinforcement planting helps to ensure an adequate stand.

This soil is unsuitable for building site development and for all kinds of onsite waste disposal systems because of the flooding.

The land capability classification is IVs. The woodland ordination symbol is 3S.

91—Wiota silt loam. This nearly level, well drained soil is in broad, high areas of the Wayland Terrace. Most areas are oval or oblong and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, black, friable silt loam

Subsurface layer:
10 to 15 inches, black, friable silt loam

Subsoil:
15 to 24 inches, dark brown, friable silty clay loam
24 to 60 inches, mixed dark yellowish brown, dark grayish brown, and dark brown, firm silty clay loam

In several areas the soil has more sand.

Important soil properties—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: High
Surface runoff: Slow
Shrink-swell potential: Moderate
Depth to the water table: More than 6 feet

Nearly all areas are used for cultivated crops. Only a few small areas are wooded. Corn, soybeans, and winter wheat are the commonly grown crops. This soil is suitable for intensive row cropping. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration. No major limitations affect the use of this soil for cultivated crops.

This soil is suited to grasses and legumes for pasture or hay. It is best suited to alfalfa, red clover, tall fescue, big bluestem, indiangrass, and other commonly grown legumes and warm- and cool-season grasses. No major concerns affect the management of pasture or hayland.

This soil is suitable for building site development and for most kinds of onsite waste disposal systems. The shrink-swell potential is the main limitation on sites for dwellings with or without basements. Constructing footings, foundations, and basement walls with adequately reinforced concrete and backfilling with sand or gravel help to prevent the structural damage caused by shrinking and swelling of the soil. Adequately reinforced steel, expansion joints, and a sand or gravel base for sidewalks and driveways help to prevent the damage caused by frost action. The soil is suitable for septic tank absorption fields if the fields are properly designed. Enlarging the fields helps to compensate for the restricted permeability. Properly designed sewage lagoons also function adequately. Sealing the bottom and berms of the lagoon may be necessary to prevent seepage and the contamination of ground water.

Low strength, the shrink-swell potential, and the potential for frost action limit the use of this soil as a site for local roads and streets. Strengthening the base material with crushed rock or other suitable material helps to prevent the damage caused by low strength. Grading the roads so that they shed water, constructing adequate roadside ditches, and installing culverts help to prevent the damage to roads and streets caused by frost action.

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

99—Fatima silt loam, frequently flooded. This nearly level, moderately well drained soil is on broad natural levees on the larger flood plains. It is subject to flooding for brief or long periods. Most areas are oval or oblong and range from 10 to 250 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, very dark grayish brown, friable silt loam

Subsurface layer:
5 to 13 inches, very dark grayish brown, friable silt loam

Subsoil:
13 to 32 inches, dark grayish brown and dark grayish brown, mottled, friable silt loam

Substratum:
32 to 60 inches, dark grayish brown, friable silt loam and grayish brown, mottled, friable silt loam

Included with this soil in mapping are small areas of Colo, Perks, and Zook soils. The poorly drained Colo and Zook soils have more clay throughout than the Fatima soil. They are in the slightly lower areas. The well drained Perks soils have more sand than the Fatima soil. They are in positions on the landscape similar to those of the Fatima soil. Included soils make up about 10 percent of the unit.

Important properties of the Fatima soil—

Permeability: Moderate
Organic matter content: Moderate
Available water capacity: Very high
Surface runoff: Medium
Shrink-swell potential: Low
Depth to the water table: 2.0 to 3.5 feet

Most areas are used for cultivated crops. Only a few small areas adjacent to stream channels are wooded. The commonly grown crops are corn and soybeans. Flooding is a major management concern. Some crop damage can be expected about 50 percent of the time, and major damage can be expected about 20 percent of the time. Short-season annuals should be planted. A conservation tillage system that leaves all or part of the crop residue on the surface maintains or improves tilth and organic matter content and increases the rate of water infiltration.

This soil is poorly suited to grasses and legumes for pasture or hay because of the frequent flooding. It is best suited to tall fescue, little bluestem, and alsike clover. Grazing when the soil is wet may cause compaction and poor tilth. Proper grazing management helps to prevent surface compaction and maintains good plant density.

This soil is suited to trees. No major soil problems affect timber management, but the use of equipment may be severely restricted because of the flooding.

This soil is unsuited to building site development and most kinds of onsite waste disposal systems because of the frequent flooding.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

Prime Farmland

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

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

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 177,510 acres in Clark County, or nearly 54 percent of the total acreage, meets the soil requirements for prime farmland. Of this acreage, 107,785 acres is prime farmland only if the soils are drained and 27,750 acres is prime farmland only if the soils are protected from flooding during the growing season. About 59,505 acres of prime farmland is made up of soils on ridgetops in the uplands. These soils have slopes of 0 to 6 percent. The remaining acreage of prime farmland is in scattered areas. Most of the prime farmland is used for cultivated crops.

Several large areas of prime farmland in Clark County have been lost to highway development and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible 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 as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures. In Clark County, the naturally wet soils generally have been adequately drained, either by artificial drainage systems or by incidental drainage resulting from cultivation, road construction, or other kinds of land development.

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

Dwight E. Snead, district conservationist, Natural Resources Conservation Service, helped prepare this section.

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

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

The soils in Clark County have good potential for sustained food production. Most of the soils on flood plains are adequately drained and have a high available water capacity. About 177,510 acres in Clark County meets the requirements for prime farmland. An additional 81,060 acres of moderately sloping and strongly sloping soils would be favorable for crop production if adequate conservation measures were applied so that the soils were protected from erosion. The potential for increasing production on prime farmland soils and on moderately sloping soils is good if the latest crop production technology is used, such as applying conservation practices and installing drainage systems and irrigation systems.

In 1990, about 124,400 acres in Clark County was used for cultivated crops and hay (Missouri Crop and Livestock Reporting Service, 1992). Of this acreage, approximately 88,900 acres was used for corn and soybeans and 15,000 acres for winter wheat. Hayland made up about 19,900 acres. The remaining acreage was used for specialty crops or was idle land.

Soybeans, corn, and winter wheat are the principal cultivated crops in Clark County. The acreage used for corn and soybeans has gradually decreased by about 37 percent since 1985. Grain sorghum and a mixture of sorghum and sudangrass are also regularly grown. Double cropping is common in the county. When this practice is applied, soybeans are planted after the winter wheat has been harvested. The main management concerns affecting cropland in the county are water erosion, wetness, flooding, and maintenance of fertility and tilth. Because of insufficient soil moisture during many hot summer months, irrigation would increase crop production in most years.

Water erosion is the major problem on nearly all of the sloping cropland and overgrazed pasture in Clark County. All soils that have slopes of more than 1 percent are susceptible to water erosion.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Adco, Gorin, Leonard, and Weller soils. Erosion also reduces the productivity of the soils that tend to be droughty because they are moderately deep over weathered glacial till. Examples are Armstrong and Keswick soils. Second, soil erosion on cropland results in sedimentation of streams, lakes, and ponds. Minimizing erosion reduces this pollution and improves the quality of water for municipal use, for recreation, and for fish and other wildlife. Erosion control also prolongs the usefulness of the ponds and lakes by preventing them from filling up with sediment.

In some areas seedbed preparation and tillage are especially difficult because of clayey spots where the original, friable surface soil has been eroded away. Such spots occur in areas of Armstrong, Gorin, Keswick, and Weller soils. Erosion-control measures provide a protective surface cover, reduce the runoff rate, and increase the rate of water infiltration. A conservation tillage system that keeps vegetative cover or crop residue on the soil can hold erosion losses to amounts that will not reduce the productive capacity of the soils. Growing grasses and legumes for pasture and hay is a very effective means of controlling erosion. If legumes, such as alfalfa and red clover, are used in crop rotations, tilth is improved and nitrogen is provided for the following crop.

Terraces reduce the length of slopes and thus help to control runoff and erosion. Conventional terraces can be constructed on uneroded upland soils that have a slope gradient of up to 9 percent. They are most practical on soils that have long, smooth slopes. Grassed back slope and other types of terraces can be constructed on the steeper slopes. Minimizing tillage on sloping soils and leaving large quantities of crop residue on the surface increase the rate of water infiltration and help to control runoff and erosion. These practices can be adapted to many of the soils in the county, but they are less successful on severely eroded soils that have a clayey surface layer. On Adco, Armstrong, Gorin, Keswick, Leonard, and Weller soils, special management techniques are needed if terracing exposes the clayey subsoil.

If the soil is not suitable for terracing or if the farmer or manager does not prefer terraces, other alternatives may be used. Contour stripcropping, for example, helps to minimize erosion by alternating contoured strips of close-growing crops with strips of clean-tilled crops. Strips of grasses or grasses and legumes are generally used for hay. The areas between the strips are cultivated and planted to row crops, which are grown on the contour. A system of conservation tillage that includes various degrees of minimum tillage or no-till is effective in controlling erosion on sloping land and can be used on many of the soils in the county. Special management techniques are needed, however, in areas where a no-till system is applied.

Wetness and flooding are major management concerns on about 60 percent of the acreage used for crops and pasture in the county. Belinda, Colo, Edina, Gilford, Leonard, Moniteau, Vesser, Wakeland, and Zook soils are naturally wet. Crop production is reduced on these soils during some part of the year. Commonly, crop yields can be increased by 50 percent if drainage is provided. Occasional and frequent flooding can hinder crop production on Colo, Fatima, Gilford, Klum, Huntsville, Nodaway, Beaucoup, Orion, Perks, Lawson, Vesser, Zook, and Wakeland soils. The flooding on these soils commonly occurs during the period November through May. A watershed project has been implemented in the Buck and Doe Run Watershed, the North Fabius River Watershed, and the Wyaconda River Watershed. This project has greatly reduced the hazard of flooding in these areas.

Soil fertility is naturally lower in most of the eroded soils and shallow soils. All soils, however, require additional plant nutrients for maximum production. Most of the soils in Clark County are naturally acid in the upper part of the root zone and need applications of ground limestone to raise the pH level and the calcium level sufficiently for optimum growth of legumes. On all soils, additions of lime and fertilizer should be based on results of soil tests, on the needs of the crop, and on the level of production desired. The Cooperative Extension Service can help to determine the kinds and amounts of fertilizer and lime needed. Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil.

Most of the uneroded upland soils used for crops in Clark County have a dark surface layer of loam, silt loam, or silty clay loam that has a moderate or high content of organic matter. Generally, if tillage is excessive the structure of the loam or silt loam soils becomes weaker and the surface becomes compacted. Heavy rainfall can cause the formation of a crust on the surface. This crust, which is hard when dry, reduces the infiltration of water and increases the runoff rate. Regular additions of crop residue, manure, and other organic material improve soil structure and tilth.

In all of the eroded upland soils in the county, the content of clay in the surface layer is higher than that in the surface layer of corresponding uneroded soils. As a result, tilth is poorer, the infiltration rate is slower, and the runoff rate is more rapid. Conservation practices are needed to reduce the hazard of further erosion.

Pasture and hay crops suited to the soils and climate in the county include several legumes and cool- and warm-season grasses. Alfalfa and red clover are the most common legumes grown for hay. They are also included in mixtures with bromegrass, orchardgrass, or timothy grown for hay or pasture.

The warm-season grasses adapted to the county are big bluestem, little bluestem, indiangrass, and switchgrass. These grasses grow well during the hot summer months and can provide good-quality forage during periods when cool-season plants are dormant. Prescribed burning of warm-season grasses can be used to control undesirable vegetation and thus can improve the quality and quantity of forage produced. Burning generally is not needed more than once every 3 to 5 years. Before proper grazing management can be applied, fields of warm-season grasses should be separated from fields of cool-season grasses.

The major management concerns affecting most of the pastureland in the county are sheet erosion and gully erosion caused by overgrazing. Grazing when the soils are wet causes surface compaction, poor tilth, and low plant density. Droughtiness in the sandy soils and insufficient soil moisture during dry summer months on all of the soils also are concerns. Proper stocking rates and rotation grazing are needed. Restricted grazing during wet periods helps to prevent surface compaction and damage to the stands. Also, keeping the grasses at a desirable height reduces the hazard of sheet and gully erosion.

Irrigation increases yields by providing supplemental water during critical periods of crop growth. Double cropping is possible on irrigated soils. Soybeans, for example, can be planted directly into wheat stubble, and enough water can be supplied by irrigation to ensure germination and plant growth.

Soil and water conservation needs on upland soils should be considered when the relative costs and benefits of an irrigation system are weighed. After periods of irrigation, the saturated topsoil is extremely vulnerable to erosion if intense rainfall occurs. Such accelerated erosion can drastically reduce the natural fertility of the soils and can cause rapid sedimentation of any bodies of water downstream. Because most irrigation systems are supplied by reservoirs that are in the irrigated watershed, such sedimentation reduces the irrigation capacity. There are no wells in Clark County that can produce enough water for irrigation purposes; therefore, protection of the topsoil from erosion is critical. Maintenance of terraces is also a management concern on irrigated soils. If ruts form where the wheels of the irrigation system pass over the saturated terrace berm, the effectiveness of the terraces is reduced.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. 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 Natural Resources 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 woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Douglas C. Wallace, forester, Natural Resources Conservation Service, helped prepare this section.

According to estimates by the Missouri Department of Conservation, approximately 19 percent of Clark County, or about 63,342 acres, was forested in 1986. Upland woodland tracts in the county are primarily small, private holdings of 10 to 50 acres and are essentially unmanaged (Geissman and others, 1986). Larger continuous tracts of woodland are on the bluffs adjacent to the flood plains along the Mississippi and Des Moines Rivers. On the flood plains, wooded tracts occur only as long, narrow bands bordering streams and rivers.

Tree species and growth rates in the county vary, depending on soil properties, site characteristics, and past management.

Soil properties that affect the growth of trees include reaction (pH), fertility, drainage, texture, structure, and soil depth. The soil also serves as a reservoir for moisture, provides an anchor for roots, and supplies essential plant nutrients. Soils in which these properties are not extreme and that have an effective rooting depth of more than 40 inches provide the best medium for timber production.

Site characteristics that affect tree growth include aspect and topographic position. These site characteristics influence the amount of available sunlight, air drainage, soil temperature, soil moisture, and relative humidity. Generally, north and east aspects and the lower slope positions, which are cooler and have better moisture conditions, are the best upland sites for tree growth. The most productive bottom-land soils are generally deep, moderately well drained, and occasionally flooded.

Management activities can influence woodland productivity and should be aimed at eliminating factors that cause tree stress. Generally, such management includes thinning over-stocked young stands; harvesting old, mature trees; and preventing destructive fire and grazing by livestock. Fire and grazing have very negative impacts on forest growth and quality. Although forest fires are no longer a major problem in the county, about 50 percent of the woodland is still subject to grazing. Grazing destroys the leaf layer on the surface, compacts the soil, and kills or damages tree seedlings. Woodland sites that have not been grazed or burned have the highest potential for optimum timber production.

Winfield, Lindley, and Gorin soils, which are in the northeastern and east-central parts of the county, support the largest acreages of upland timber. Typical species are white oak, northern red oak, black oak, and sugar maple. Post oak, black oak, shagbark hickory, and blackjack oak occur in areas of the less productive Keswick and Gara soils in the southwestern part of the county. Undisturbed timber areas on Winfield and Bucklick soils are very productive.

Along the streams of the major flood plains, Beaucoup, Fatima, Gilford, Huntsville, Lawson, Moniteau, Nodaway, Orion, Perks, and Wakeland soils support bottom-land hardwoods adapted to wet or flooded soil conditions. Most of these sites have been cleared for crop production. The remaining wooded areas typically support silver maple, hackberry, American elm, swamp white oak, sycamore, cottonwood, and pin oak. Bur oak, shellbark hickory, and walnut are common on flood plains along the smaller streams and the higher stream terraces and along the major streams. A high potential for excellent timber growth exists on these sites.

Specialty tree plantings, such as Christmas trees, nut trees, and fuelwood trees, can be very successful if adapted species are used. Christmas tree plantings can be established on any soil that is not poorly drained or very poorly drained. Species of trees suited to the soils in Clark County are Scotch pine, Austrian pine, white pine, and Douglas-fir. Nut trees, such as black walnut, are best suited to deep, loamy, moderately well drained or well drained soils, such as Winfield soils in the uplands and Klum soils on the flood plains. Other soils are also suited but may be less productive. Tree plantations for fuelwood utilizing fast-growing species are feasible in Clark County. The species most adaptable for this purpose are green ash, black locust, sycamore, and silver maple.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Douglas C. Wallace, forester, Natural Resources Conservation Service, helped prepare this section.

Living plants play an important role in supporting our life and improving its condition. When properly used and maintained, plants provide positive solutions to problems in our contemporary environment. In Clark County, windbreaks and environmental plantings can be utilized throughout the landscape for a variety of engineering, climatological, and esthetic purposes.

Windbreaks can be grown successfully in most areas of Clark County. Some important considerations affecting the management of farmstead and field windbreaks are design and layout, species selection, site preparation, seedling handling, weed management, supplemental watering, and protection from diseases, insects, and livestock.

Farmstead windbreaks make the farmstead more comfortable, reduce energy costs, increase yields from gardens and fruit trees, enhance wildlife populations, buffer noises, and increase property values (Scholten, 1988).

Feedlot windbreaks can be used to protect livestock from wind and snow. Windbreaks significantly minimize calf losses, make feeding easier, and enable livestock to maintain better weight with less feed.

Farmstead and feedlot windbreaks are generally three or more rows deep and include at least two rows of coniferous trees. The windbreaks should be established on the windward side of the area to be protected and should be perpendicular to the prevailing winds. Well designed farmstead and feedlot windbreaks are needed in Clark County, especially in the open areas of former prairie in the Adco-Edina and Zook-Colo-Huntsville associations, which are described under the heading "General Soil Map Units."

Field windbreaks or shelterbelts protect field crops and areas of bare soil from the effects of strong winds. Field windbreaks minimize soil losses, increase crop yields, help to prevent the spread of weeds, and enhance wildlife populations (Brandle and others, 1988). Careful planning is needed. Field boundaries, irrigation systems, power lines, and roads should be considered when the location of field windbreaks is determined. Windbreaks should be oriented at right angles to the prevailing winds. A typical field windbreak system consists of a series of single rows of trees or shrubs. Field windbreaks are adaptable to many locations in Clark County but are most beneficial in areas of the Zook-Colo-Huntsville and Perks-Excello associations.

Environmental plantings can be used for beautification, as visual screens, and for control of acoustical and climatological problems around buildings and other living spaces. Plants whose height, shape, color, and texture are compatible with the surrounding area, structures, and desired use should be selected (Robinette, 1972). Trees and shrubs can be easily established in most parts of Clark County with proper site preparation and control of weeds and other competing vegetation.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Keith Jackson, biologist, Missouri Department of Conservation, helped prepare this section.

Recreational facilities in Clark County include campgrounds, historical areas, museums, hiking trails, hunting areas, lakes, rivers, swimming pools, and a public archery and firearms range.

The Battle of Athens State Park, at the site of one of the largest Civil War battles in northeastern Missouri, offers opportunities for camping, hiking, boating, and fishing. Hiking, hunting, and other nature appreciation opportunities are also available in several conservation areas managed by the Missouri Department of Conservation. These include the Fox Valley (1,087 acres), Charlie Heath (1,650 acres), Clark (1,380 acres), Rose Pond (379 acres), Neeper (227 acres), and Buck and Doe Run (192 acres) conservation areas. Other public land in the county includes Gregory Landing and a 1,120-acre wildlife refuge managed by the U.S. Fish and Wildlife Service.

Several rivers in the county, including the Mississippi and Des Moines Rivers, provide many opportunities for water-related recreational activities. The Missouri Department of Conservation manages several accesses to these rivers.

Exhibits and Civil War reenactments are available at the Battle of Athens State Park. The survey area also features an abundance of geodes and a variety of wildlife species.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones 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

Keith Jackson, biologist, Missouri Department of Conservation, helped prepare this section.

Clark County is one of 21 counties in Missouri that make up the Northeast Riverbanks Zoogeographic Region. As the transition zone between the prairie and the Ozark Border, the region provides a variety and abundance of edge-growth vegetation that makes excellent wildlife habitat. The diversity of cover types makes this region one of the richest wildlife areas in the state. Major problems affecting the county's wildlife resource include the conversion of grasslands, hedgerows, and brushy draws to row crops; grass fields composed of monocultures of closely grazed or mowed cool-season grasses; and tillage in the fall rather than in the spring. These practices impact wildlife by reducing the amount of winter, escape, and nesting cover and by limiting the availability of waste grain for winter food.

More than 215 species of fish and wildlife have been recorded in Clark County, and more than 100 additional species may inhabit the county. Some species are seen only rarely, and many others migrate through the area in the spring and fall. Typical nongame species include red-winged blackbird, house wren, red-tailed hawk, eastern garter snake, johnny darter, western chorus frog, and deer mouse. The most common game species include bobwhite quail, ring-necked pheasant, wild turkey, eastern cottontail rabbit, white-tailed deer, fox squirrels, gray squirrels, channel catfish, largemouth bass, bluegill, common snapping turtle, bullfrog, coyote, and raccoon.

The federally endangered bald eagle has been sighted in the county. The federally endangered Indiana bat, least tern, and fat pocketbook pearly mussel may also inhabit the county, although sightings of these species have not been recorded. Eight members of the state's rare and endangered species list have also been found in the survey area. These include lake sturgeon, Alabama shad, central mudminnow, Blanding's turtle, Illinois mud turtle, western fox snake, upland sandpiper, and least weasel.

The Lindley-Keswick-Gorin, Armstrong-Leonard-Gara, Adco-Edina, Zook-Colo-Huntsville, Vesser-Klum-Wakeland, Perks-Excello, and Moniteau-Plainfield associations provide the majority of the openland habitat for wildlife. These associations are described under the heading "General Soil Map Units." Small tracts of woodland, hedgerows, fencerows, and other areas that provide woody or brushy cover are scattered throughout much of these associations. Such "hard cover" areas supply an important type of habitat that is rapidly disappearing in many parts of the intensively cultivated sections of the state. Practices that increase diversity of habitat, such as adding legumes to pastures and using field borders in crop fields, improve wildlife habitat. Typical openland species include plains leopard frog, bobwhite quail, ring-necked pheasant, eastern meadowlark, and plains pocket gopher.

The majority of the county's woodland resource is in areas of the Lindley-Winfield-Bucklick and Lindley-Keswick-Gorin associations, although portions of all of the associations in the county support some woodland. The majority of the timber has not been managed and consequently is in poor to fair condition. Increased application of measures that improve timber stands would improve the value of this resource for wildlife and for landowners. Such measures include thinning the stands and preventing grazing of the woodland by livestock. Typical woodland wildlife species include American toad, three-toed box turtle, turkey, tufted titmouse, white-breasted nuthatch, deer mouse, and raccoon.

Nearly all of the remaining wetland habitat is in the Vesser-Klum-Wakeland and Zook-Colo-Huntsville associations. Most of the original wetlands have been converted to cropland. The remaining natural wetlands are largely wooded and have scattered oxbows that provide many benefits to wildlife. Wooded areas adjacent to streams, called riparian areas, are especially attractive to wildlife and also help to prevent excessive streambank erosion. Managed wetlands include the U.S. Fish and Wildlife Service's Gregory Landing (1,120 acres) and three small wetlands managed by the Missouri Department of Conservation, which include Rose Pond Natural Area (103 acres), Charlie Heath Conservation Area (40 acres), and Fox Valley Conservation Area (13 acres). The numerous small lakes and ponds in the county also contribute to the wetland resource. Typical wetland species include eastern tiger salamander, bullfrog, northern water snake, least bittern, pied-billed grebe, muskrat, beaver, and mink. The bald eagle is usually found close to wetlands and can occasionally be observed near the Mississippi River in late fall, winter, and early spring.

More than 35 species of fish are known to inhabit the waters of Clark County, and 25 to 30 additional species are possible. The Mississippi and Des Moines Rivers are the most important bodies of water in the county. The Wyaconda and Fox Rivers also provide fair fishing. Channel catfish, flathead catfish, carp, drum, and sunfish are the primary quarry for anglers.

Channelization and the removal of trees adjacent to rivers and streams are the main causes of instream fish habitat loss. Streambank stabilization is one of the best methods of improving habitat in streams. Although there are no large impoundments in Clark County, the numerous ponds and watershed lakes provide fine flat-water fishing. Largemouth bass, bluegill, crappie, and channel catfish are the primary species in these impoundments. The largest public impoundment is the 108-acre fishing lake in the Fox Valley Conservation Area. Habitat for fish can be improved in ponds by adding brush piles and other "fish attractors." Fencing livestock out of ponds and using grass filter strips around ponds help to minimize the amount of sediment, pesticides, and nutrients entering the ponds and thus improve water quality and prolong the life of the ponds.

Wildlife habitat can be improved throughout the county. Management practices include using a system of conservation tillage, saving existing hedgerows and brushy areas, planting windbreaks, planting more legumes and native prairie grasses for forage production, maintaining proper grazing and mowing heights, and establishing grass-legume mixtures or trees in areas of marginal cropland.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties 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, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to 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 the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and 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 to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

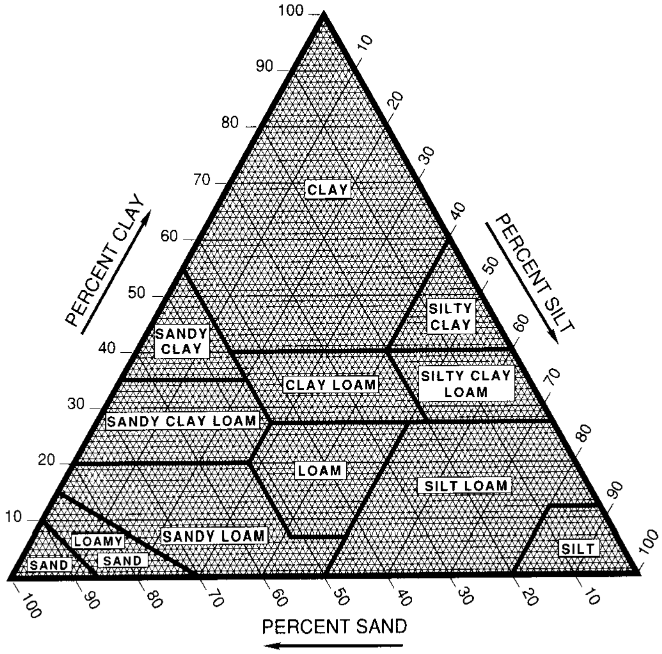

Figure 13.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 13). "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 (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

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 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated 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, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). 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 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

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 Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

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 Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a humid 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. An example is Aquertic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, montmorillonitic, mesic Aquertic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. 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" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). 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."

Adco Series

The Adco series consists of very deep, somewhat poorly drained, very slowly permeable soils on uplands. These soils formed in loess. Slopes range from 1 to 5 percent.

Typical pedon of Adco silt loam, 1 to 5 percent slopes, in a cultivated field, 2,400 feet north and 1,500 feet west of the southeast corner of sec. 2, T. 63 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 14 inches; grayish brown (10YR 5/2) silt loam; weak thick platy structure; friable; common fine roots; many distinct silt coatings on faces of peds; many distinct organic stains on faces of peds and in old root channels; slightly acid; clear smooth boundary.

Btg—14 to 18 inches; dark grayish brown (10YR 4/2) silty clay; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate fine and medium subangular blocky structure; firm; many prominent clay films on faces of peds; many distinct silt coatings in pores and on faces of peds; strongly acid; clear smooth boundary.

Bt1—18 to 26 inches; dark brown (10YR 4/3) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many distinct clay films on faces of peds; few faint silt coatings in pores and on faces of peds; strongly acid; clear wavy boundary.

Bt2—26 to 33 inches; yellowish brown (10YR 5/4) silty clay; many fine prominent grayish brown (2.5Y 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very firm; common fine roots; many faint clay films on faces of peds; few medium concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

Bt3—33 to 56 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8) and common medium prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure; firm; few fine roots; few distinct clay films on faces of peds and in root channels; few medium concretions of iron and manganese oxides; moderately acid; clear wavy boundary.

BCg—56 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium prominent yellowish red (5YR 5/8) and reddish yellow (7.5YR 6/8) mottles; weak coarse prismatic structure; firm; common fine concretions of iron oxides; slightly acid.

The Ap horizon has chroma of 1 to 3. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6.

Alvin Series

The Alvin series consists of very deep, well drained, moderately rapidly permeable soils on stream terraces. These soils formed in loamy and sandy sediments. Slopes range from 3 to 9 percent.

Typical pedon of Alvin fine sandy loam, 3 to 9 percent slopes, in a cultivated field, 150 feet south and 2,250 feet east of the northwest corner of sec. 25, T. 65 N., R. 7 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

E—7 to 15 inches; brown (7.5YR 5/4) fine sandy loam; weak thick platy structure; very friable; common fine roots; moderately acid; clear smooth boundary.

Bt1—15 to 21 inches; brown (7.5YR 5/4) fine sandy loam; weak coarse subangular blocky structure parting to weak fine subangular blocky; firm; common fine roots; few prominent clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—21 to 27 inches; brown (7.5YR 5/4) fine sandy loam; moderate coarse subangular blocky structure; firm; common fine roots; common prominent clay films on faces of peds and in old root channels; very strongly acid; clear smooth boundary.

Bt3—27 to 36 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; moderately acid; gradual smooth boundary.

E&Bt—36 to 60 inches; brown (7.5YR 5/4) loamy sand (E); single grain; loose; strong brown (7.5YR 4/6) sandy loam (Bt); weak fine subangular blocky structure; very friable; few iron stains; moderately acid.

The A horizon has value of 4 or 5 and chroma of 2 to 3. The Bt and BC horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6.

Armstrong Series

The Armstrong series consists of very deep, moderately well drained, slowly permeable soils on uplands. These soils formed in loamy sediments and weathered glacial till. Slopes range from 5 to 18 percent.

Typical pedon of Armstrong loam, 5 to 12 percent slopes, eroded, in a cultivated field, 70 feet north and 150 feet east of the southwest corner of sec. 19, T. 64 N., R. 8 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; mixed peds of reddish brown (5YR 4/4) clay loam; weak fine granular structure; friable; many fine roots; few fine concretions of iron and manganese oxides; 1 percent fine gravel; neutral; abrupt smooth boundary.

Bt1—7 to 12 inches; mixed reddish brown (5YR 4/4) and very dark grayish brown (10YR 3/2) clay loam; weak very coarse subangular blocky structure parting to weak medium subangular blocky; firm; many fine roots; few clay films on faces of peds; few fine concretions of iron and manganese oxides; 2 percent fine gravel; slightly acid; clear smooth boundary.

2Bt2—12 to 20 inches; reddish brown (5YR 4/4) clay; few fine prominent red (2.5YR 4/6) and grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few fine roots; many distinct clay films on faces of peds; many prominent silt and sand coatings in vertical crack fills; 5 percent fine gravel; strongly acid; clear smooth boundary.

2Bt3—20 to 28 inches; dark brown (7.5YR 4/4) clay; common prominent yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few fine roots; few distinct clay films on faces of peds; few faint silt and sand coatings on faces of peds and in vertical crack fills; 7 percent fine gravel; strongly acid; clear wavy boundary.

2Bt4—28 to 56 inches; yellowish brown (10YR 5/4) clay loam; many coarse distinct light brownish gray (10YR 6/2) and many coarse prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many faint clay films on faces of peds; few distinct silt coatings on faces of peds and in vertical crack fills; 7 percent fine gravel; slightly aid; clear wavy boundary.

2C—56 to 60 inches; brown (10YR 5/3) clay loam; many coarse prominent light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; massive; very firm; 5 percent fine gravel; slightly alkaline.

In some pedons the BC and C horizons have carbonates. The A horizon has chroma of 2 or 3. The E horizon, if it occurs, has value of 4 or 5. The upper part of the Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. In some pedons it has matrix hue of 7.5YR and has mottles with hue of 5YR or 2.5YR. The lower part of the Bt horizon typically has hue of 7.5YR or 5YR and, less commonly, 10YR. It has value of 4 or 5 and chroma of 1 to 6.

Armstrong loam, 12 to 18 percent slopes, eroded, is a taxadjunct because it has a thinner dark surface layer than is defined as the range for the series. This difference, however, does not significantly affect the use and behavior of the soil. This soil is classified as fine, montmorillonitic, mesic Aquertic Hapludalfs.

Beaucoup Series

The Beaucoup series consists of very deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Beaucoup silt loam, occasionally flooded, in a fallow field, approximately 638 feet east and 530 feet north of the southwest corner of sec. 34, T. 64 N., R. 6 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse and medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A1—6 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium and fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

A2—13 to 21 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

Bg1—21 to 32 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 6/1) dry; few fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; neutral; clear wavy boundary.

Bg2—32 to 44 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; neutral; clear wavy boundary.

Bg3—44 to 52 inches; dark gray (10YR 4/1) silty clay loam; common medium prominent dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; neutral; clear wavy boundary.

Bg4—52 to 60 inches; dark gray (10YR 4/1) silty clay loam; common medium prominent dark yellowish brown (10YR 4/6) and brownish yellow (10YR 6/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; neutral.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 4 or 5. It typically is silty clay loam, but in some pedons it has subhorizons of silt loam.

Belinda Series

The Belinda series consists of very deep, poorly drained, very slowly permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Typical pedon of Belinda silt loam, in a cultivated field, 2,100 feet east and 2,400 feet north of the southwest corner of sec. 5, T. 64 N., R. 7 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak very thick platy structure parting to weak very fine granular; friable; many fine roots; neutral; abrupt smooth boundary.

Eg—8 to 16 inches; gray (10YR 5/1) silt loam, light gray (10YR 6/1) dry; weak very thick platy structure; friable; few fine roots; common organic coatings on faces of peds; slightly acid; clear wavy boundary.

Btg1—16 to 20 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/4) and many fine prominent yellowish red (5YR 5/8) mottles; weak coarse angular blocky structure parting to moderate very fine angular blocky; firm; few fine roots; many faint clay films on faces of peds; strongly acid; clear wavy boundary.

Btg2—20 to 31 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate fine angular blocky; firm; few fine roots; many distinct clay films on faces of peds; moderately acid; clear wavy boundary.

Btg3—31 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent light reddish brown (2.5YR 6/4) and light red (2.5YR 6/6) mottles; weak medium prismatic structure; firm; few fine roots; many prominent clay films on faces of peds; slightly acid; clear wavy boundary.

Btg4—45 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm; few fine roots; common faint clay films on faces of peds and in root channels; slightly acid.

The A horizon has chroma of 1 or 2. The E horizon has value of 5 or 6 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay, clay, or silty clay loam. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Bucklick Series

The Bucklick series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in residuum derived from limestone interbedded with thin layers of shale. Slopes range from 18 to 35 percent.

Typical pedon of Bucklick silt loam, 18 to 35 percent slopes, on a wooded slope, 300 feet east and 200 feet north of the southwest corner of sec. 32, T. 64 N., R. 6 W.

A—0 to 6 inches; dark yellowish brown (10YR 3/4) silt loam, dark yellowish brown (10YR 4/4) dry; weak fine granular structure; friable; many fine and many medium roots; strongly acid; clear smooth boundary.

E—6 to 10 inches; brown (7.5YR 5/4) silt loam; common fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; common medium and few fine roots; few prominent silt coatings on faces of peds; moderately acid; clear wavy boundary.

Bt1—10 to 20 inches; red (2.5YR 4/8) clay loam; weak medium prismatic structure parting to moderate medium angular blocky; firm; few fine and common medium roots; common distinct clay films on faces of peds and in old root channels; very strongly acid; clear wavy boundary.

Bt2—20 to 31 inches; red (2.5YR 4/8) clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; many medium and few large roots; 5 percent chert gravel; common distinct clay films on faces of peds and in old root channels; very strongly acid; clear wavy boundary.

Bt3—31 to 40 inches; red (2.5YR 4/8) clay loam; weak coarse prismatic structure parting to strong medium angular blocky; firm; few medium and large roots; common distinct clay films on faces of peds and in old root channels; few fine concretions of iron and manganese oxides; 5 percent chert gravel; strongly acid; clear wavy boundary.

Bt4—40 to 46 inches; yellowish red (5YR 4/6) clay loam; weak fine subangular blocky structure; firm; few medium and large roots; common distinct clay films on faces of peds and in old root channels; few fine concretions of iron and manganese oxides; 5

percent chert gravel; strongly acid; clear wavy boundary.
2R—46 inches; limestone bedrock.

The A horizon has value of 3 or 4 and chroma of 2 to 4. The upper part of the Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. The lower part has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 3 to 8.

Colo Series

The Colo series consists of very deep, poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Colo silty clay loam, occasionally flooded, in a cultivated field, 200 feet north and 250 feet east of the southwest corner of sec. 27, T. 65 N., R. 6 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; firm; many fine roots; slightly acid; abrupt smooth boundary.
A1—8 to 18 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; many fine roots; neutral; clear smooth boundary.
A2—18 to 28 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent yellowish brown (10YR 5/4) mottles; weak fine angular blocky structure; firm; common fine roots; neutral; clear wavy boundary.
Bg1—28 to 50 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate coarse prismatic structure parting to weak fine angular blocky; firm; few fine roots; neutral; clear wavy boundary.
Bg2—50 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak fine angular blocky; firm; neutral.

The A horizon has value of 2 or 3. The Bg horizon has value of 3 or 4 and chroma of 0 or 1.

Edina Series

The Edina series consists of very deep, poorly drained, very slowly permeable soils on uplands. These soils formed in loess. Slopes are 0 to 1 percent.

Typical pedon of Edina silt loam, in a cultivated field, 300 feet west and 1,050 feet south of the northeast corner of sec. 25, T. 65 N., R. 8 W.

Ap1—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
Ap2—8 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak medium platy structure parting to weak medium granular; friable; common fine roots; few faint stains of iron oxides; neutral; clear smooth boundary.
Eg—12 to 20 inches; dark grayish brown (10YR 4/2) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to weak medium granular; friable; common fine roots; common distinct organic stains; neutral; clear smooth boundary.
Bt—20 to 31 inches; very dark gray (10YR 3/1) silty clay; common fine prominent dark yellowish brown (10YR 4/6) and many medium prominent yellowish red (5YR 5/6) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; many faint clay films on faces of peds; common silt coatings; moderately acid; clear wavy boundary.
Btg1—31 to 42 inches; dark gray (10YR 4/1) silty clay; common medium prominent yellowish red (5YR 5/6) and red (2.5YR 5/8) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; many distinct clay films on faces of peds; few distinct organic coatings in pore linings; moderately acid; clear wavy boundary.
Btg2—42 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/8) and common medium distinct light olive brown (2.5Y 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many prominent clay films on faces of peds; common prominent silt coatings; common organic coatings in pore linings; slightly acid; clear wavy boundary.
Cg—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent dark brown (7.5YR 4/4) and common medium distinct grayish brown (2.5Y 5/2) mottles; massive; very firm; common distinct silt coatings; few faint organic stains; neutral.

The A horizon has value of 2 or 3. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Excello Series

The Excello series consists of very deep, poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Excello clay loam, occasionally flooded, in a cultivated field, 700 feet north and 1,000 feet east of the southwest corner of sec. 35, T. 63 N., R. 6 W.

Ap—0 to 6 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; weak fine angular blocky structure; friable; common fine and common medium roots; neutral; clear smooth boundary.

A—6 to 14 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; weak medium angular blocky structure; friable; common fine and common medium roots; neutral; clear wavy boundary.

Bg1—14 to 24 inches; very dark gray (10YR 3/1) sandy clay loam, gray (10YR 5/1) dry; weak medium prismatic structure; friable; common fine roots; slightly acid; clear wavy boundary.

Bg2—24 to 31 inches; very dark gray (10YR 3/1) sandy clay loam, gray (10YR 5/1) dry; few fine prominent dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; friable; common fine roots; slightly acid; clear wavy boundary.

Bg3—31 to 41 inches; dark gray (10YR 4/1) loam; common prominent dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; friable; few fine roots; slightly acid; clear wavy boundary.

Cg—41 to 60 inches; dark gray (10YR 4/1) sandy clay loam; common prominent strong brown (7.5YR 4/6) mottles; massive; friable; few fine roots; slightly acid.

The A horizon has value of 2 or 3 and chroma of 1 or less. The Bg horizon has hue of 10YR or is neutral in hue. It has value of 3 or 4 and chroma of 0 or 1.

Fatima Series

The Fatima series consists of very deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Fatima silt loam, frequently flooded, in a fallow field, approximately 583 feet north and 600 feet east of the southwest corner of sec. 36, T. 64 N., R. 6 W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—5 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak thick platy structure parting to weak coarse subangular blocky; friable; common fine roots; slightly acid; clear wavy boundary.

Bw—13 to 22 inches; dark grayish brown (10YR 4/2) silt loam; weak thick platy structure parting to weak medium subangular blocky; friable; few fine roots; few faint organic coatings on faces of peds; slightly acid; clear wavy boundary.

Bg—22 to 32 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint dark gray (10YR 4/1) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; few fine roots; slightly acid; gradual irregular boundary.

Cg1—32 to 43 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct gray (10YR 5/1) and dark yellowish brown (10YR 4/6) mottles; massive; few fine roots; slightly acid; gradual irregular boundary.

Cg2—43 to 49 inches; grayish brown (10YR 5/2) silt loam; common medium distinct dark yellowish brown (10YR 4/6) and common fine distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; very few roots; many iron and manganese stains; slightly acid; gradual irregular boundary.

Cg3—49 to 60 inches; grayish brown (10YR 5/2) silt loam; common medium prominent dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; massive; friable; very few very fine roots; many iron and manganese stains; slightly acid.

The A horizon has value of 3 or 4. The Bw horizon has value of 3 to 5. It is silt loam or loam. The C horizon has chroma of 1 or 2.

Gara Series

The Gara series consists of very deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in glacial till. Slopes range from 18 to 35 percent.

Typical pedon of Gara loam, 18 to 35 percent slopes, eroded, in a pasture, 2,400 feet north and 170 feet west of the southeast corner of sec. 13, T. 63 N., R. 8 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many fine roots; 1 percent fine gravel; neutral; clear wavy boundary.

BE—6 to 9 inches; dark yellowish brown (10YR 4/4) and dark brown (10YR 3/3) loam; moderate medium subangular blocky structure; firm; many fine roots; 1 percent fine gravel; few distinct wormcasts; neutral; clear wavy boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; many distinct clay films on faces of peds; few prominent wormcasts; few distinct silt and very fine sand coatings on faces of peds; 1 percent fine gravel; moderately acid; clear wavy boundary.

Bt2—16 to 28 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; firm; few fine roots; few distinct clay films on faces of peds; common distinct silt or sand coatings on faces of peds; few fine concretions of iron and manganese oxides; 1 percent fine gravel; strongly acid; clear wavy boundary.

Bt3—28 to 36 inches; strong brown (7.5YR 5/6) clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; few distinct clay films on faces of peds; few fine concretions of iron and manganese oxides; 1 percent fine gravel; slightly acid; clear wavy boundary.

BC—36 to 44 inches; strong brown (7.5YR 5/6) clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; firm; few fine roots; few faint clay films on vertical faces of peds and in pores; 1 percent fine gravel; neutral; clear wavy boundary.

Bk—44 to 60 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; many soft accumulations of calcium carbonates; 2 percent fine gravel; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates typically are the same. The soils have about 1 to 5 percent fine or medium gravel throughout the solum and in the C horizon.

The A horizon has chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6.

Gilford Series

The Gilford series consists of very deep, poorly drained soils on flood plains. These soils formed in loamy and sandy sediments. Permeability is moderately rapid in the upper part and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Gilford sandy loam, occasionally flooded, in a cultivated field, 500 feet east and 2,600 feet north of the southwest corner of sec. 14, T. 64 N., R. 6 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

A—7 to 15 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak coarse and medium subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

Bg1—15 to 20 inches; dark gray (10YR 4/1) sandy loam; common fine prominent dark reddish brown (5YR 3/3) mottles; weak coarse subangular blocky structure; friable; common fine roots; 1 percent fine gravel; moderately acid; clear smooth boundary.

Bg2—20 to 29 inches; gray (10YR 5/1) sandy loam; common fine prominent dark reddish brown (5YR 3/3) and few fine prominent dark yellowish brown (10YR 4/6) mottles; weak coarse and medium subangular blocky structure; friable; common fine roots; 1 percent fine gravel; slightly acid; clear wavy boundary.

Bg3—29 to 40 inches; gray (10YR 5/1) sandy loam; common medium prominent yellowish red (5YR 5/6) and dark reddish brown (5YR 3/3) mottles; weak medium subangular blocky structure; friable; few fine roots; few distinct concretions of iron and manganese oxides; many prominent organic stains in vertical cracks; 1 percent fine gravel; slightly acid; clear wavy boundary.

Bg4—40 to 49 inches; light brownish gray (10YR 6/2) sandy loam; many medium prominent yellowish red (5YR 5/6) and reddish brown (5YR 4/3) mottles; weak medium subangular blocky structure; friable; few faint concretions of iron and manganese oxides; 1 percent fine gravel; neutral; clear wavy boundary.

Cg—49 to 60 inches; light brownish gray (10YR 6/2) loamy sand; many coarse prominent reddish brown (5YR 4/3) and few fine prominent yellowish red (5YR 5/6) mottles; massive; friable; few prominent iron and manganese concretions; 1 percent fine gravel; neutral.

The A horizon has chroma of 1 or 2. The Bg horizon has hue of 10YR or 2.5Y and value of 3 to 6.

Gorin Series

The Gorin series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loess and in the underlying loamy sediments. Slopes range from 3 to 9 percent.

Typical pedon of Gorin silt loam, 3 to 9 percent slopes, eroded, in a cultivated field, 1,950 feet east and

600 feet south of the northwest corner of sec. 32, T. 63 N., R. 8 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; few distinct silt coatings on faces of peds; very strongly acid; abrupt wavy boundary.

Bt1—5 to 8 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium faint dark yellowish brown (10YR 4/6) mottles; weak very fine subangular blocky structure; firm; common fine roots; few faint clay films on faces of peds; few prominent silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt2—8 to 13 inches; yellowish brown (10YR 5/4) silty clay; few fine faint grayish brown (10YR 5/2) and common fine faint brown (10YR 5/3) mottles; moderate medium angular blocky structure parting to moderate medium subangular blocky; firm; common fine roots; few faint clay films on faces of peds; few distinct silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt3—13 to 22 inches; brown (10YR 5/3) silty clay; common medium prominent light brownish gray (10YR 6/2) and many medium faint yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky structure parting to weak very fine subangular blocky; firm; common fine roots; many faint clay films on faces of peds and in old root channels; many prominent silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt4—22 to 32 inches; brown (10YR 5/3) silty clay loam; many coarse prominent light brownish gray (10YR 6/2) and common fine prominent yellowish red (5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; common fine roots; many faint clay films on faces of peds and in old root channels; very strongly acid; clear wavy boundary.

Bt5—32 to 42 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine prominent yellowish red (5YR 5/8) and many fine prominent light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak very strong subangular blocky; firm; few fine roots; many faint clay films on faces of peds; many faint stains of iron and manganese oxides; very strongly acid; clear wavy boundary.

2BC—42 to 60 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; many distinct dark stains of iron and manganese oxides; strongly acid.

The A or Ap horizon has value of 3 or 4 and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4.

Hoopeston Series

The Hoopeston series consists of very deep, somewhat poorly drained, rapidly permeable soils on high stream terraces. These soils formed in loamy and sandy alluvium. Slopes range from 1 to 5 percent.

Typical pedon of Hoopeston fine sandy loam, 1 to 5 percent slopes, in a cultivated field, 500 feet south and 2,000 feet east of the northwest corner of sec. 25, T. 65 N., R. 7 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loamy, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A—9 to 16 inches; dark brown (10YR 3/3) fine sandy loam, dark brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common fine roots; neutral; clear smooth boundary.

BA—16 to 24 inches; dark brown (10YR 4/3) fine sandy loam; few fine faint dark grayish brown (10YR 4/2) mottles; weak medium angular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bw—24 to 43 inches; dark brown (7.5YR 4/4) fine sandy loam; few fine prominent dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) mottles; weak coarse and medium angular blocky structure; friable; slightly acid; clear smooth boundary.

C1—43 to 48 inches; yellowish brown (10YR 5/6) loamy sand; few fine prominent dark grayish brown (10YR 4/2) mottles; weak coarse angular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

2C2—48 to 60 inches; yellowish brown (10YR 5/6) sand; few fine prominent dark grayish brown (10YR 4/2) mottles; single grain; loose; slightly acid.

The A horizon has value and chroma of 2 or 3. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or fine sandy loam. The content and size of sand increase with increasing depth.

Huntsville Series

The Huntsville series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Huntsville silt loam, occasionally flooded, in a cultivated field, 2,250 feet north and 1,200 west of the southeast corner of sec. 27, T. 65 N., R. 6 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.
A1—7 to 12 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.
A2—12 to 26 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; common fine roots; common distinct silt coatings on faces of peds; neutral; clear smooth boundary.
Bw1—26 to 33 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; common fine roots; common prominent silt coatings on faces of peds; few distinct organic stains; neutral; clear smooth boundary.
Bw2—33 to 46 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; few faint organic stains; neutral; clear smooth boundary.
C1—46 to 56 inches; dark brown (10YR 4/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; massive; friable; few faint organic stains; neutral; clear smooth boundary.
C2—56 to 60 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; few faint organic stains; neutral.

The A horizon has value of 2 or 3 and chroma of 2 to 4. The Bw horizon has value of 4 or 5 and chroma of 2 to 6.

Jasper Series

The Jasper series consists of very deep, well drained soils on high stream terraces. These soils formed in loamy sediments. Permeability is moderately rapid in the upper part, moderate in the next part, and rapid in the lower part. Slopes range from 1 to 5 percent.

Typical pedon of Jasper fine sandy loam, sandy substratum, 1 to 5 percent slopes, in a cultivated field, 1,750 feet west and 750 feet south of the northeast corner of sec. 5, T. 64 N., R. 6 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
A—7 to 16 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak thick platy structure parting to weak fine subangular blocky; friable; common fine roots; neutral; clear smooth boundary.
BA—16 to 25 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; firm; common fine roots; slightly acid; clear smooth boundary.
Bt1—25 to 34 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; common fine roots; common prominent clay films on faces of peds and in old root channels; slightly acid; clear smooth boundary.
Bt2—34 to 45 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; slightly acid; clear smooth boundary.
Bt3—45 to 54 inches; dark brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.
2C—54 to 60 inches; dark brown (7.5YR 4/4) loamy sand with thin strata of fine sand and fine sandy loam; massive; very friable; neutral.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 7.5YR or 10YR and chroma of 4 to 6. It is loamy sand or sand with thin strata of finer textures.

Keswick Series

The Keswick series consists of very deep, moderately well drained, slowly permeable soils on uplands. These soils formed in loamy sediments and in the underlying paleosol weathered from glacial till. Slopes range from 5 to 18 percent.

Typical pedon of Keswick loam, 5 to 12 percent slopes, eroded, in a cultivated field, 900 feet south and 1,050 feet east of the northwest corner of sec. 22, T. 64 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) and brown (10YR 5/3) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.
2Bt1—7 to 16 inches; reddish brown (5YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; few distinct clay films on faces of

peds; common distinct silt coatings on vertical faces of peds; 1 percent gravel; moderately acid; clear wavy boundary.

2Bt2—16 to 24 inches; reddish brown (5YR 4/4) clay; common medium prominent red (2.5YR 4/6) and reddish gray (5YR 5/2) mottles; moderate medium subangular blocky structure parting to weak fine subangular blocky; firm; many faint clay films on faces of peds; 2 percent fine gravel; very strongly acid; clear wavy boundary.

2Bt3—24 to 30 inches; reddish brown (5YR 4/4) clay; common medium prominent red (2.5YR 4/6) and common medium distinct reddish gray (5YR 5/2) mottles; strong coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few distinct clay films on faces of peds and in pores; 3 percent fine gravel; very strongly acid; clear wavy boundary.

2Bt4—30 to 46 inches; brown (7.5YR 5/4) clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds and in old root channels; common prominent silt coatings in fillings of cracks on vertical faces of peds; 4 percent fine gravel; moderately acid; clear wavy boundary.

2C—46 to 60 inches; yellowish brown (10YR 5/6) clay loam; common medium prominent pale red (2.5YR 6/2) mottles; massive; firm; common masses of calcium carbonate; 5 percent fine gravel; slight effervescence; moderately alkaline.

The A horizon has chroma of 1 or 2. The Bt horizon has hue of 5YR or 7.5YR and chroma of 3 to 6. The BC horizon has hue of 5YR to 10YR and chroma of 1 to 6.

Klum Series

The Klum series consists of very deep, moderately well drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Klum fine sandy loam, frequently flooded, in a cultivated field, 1,650 feet north and 100 feet east of the southwest corner of sec. 33, T. 66 N., R. 8 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; moderately acid; abrupt smooth boundary.

C1—7 to 13 inches; dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and brown (10YR 5/3) layers of fine sandy loam; appears massive but has bedding planes; friable; common fine roots; moderately acid; clear wavy boundary.

C2—13 to 22 inches; dark brown (10YR 4/3) and brown (10YR 5/3) layers of fine sandy loam; massive; very friable; common fine roots; few faint organic stains; moderately acid; clear wavy boundary.

C3—22 to 32 inches; very dark grayish brown (10YR 3/2), dark brown (10YR 4/3), and brown (10YR 5/3) layers of fine sandy loam; appears massive but has bedding planes; very friable; common fine roots; slightly acid; clear wavy boundary.

C4—32 to 46 inches; very dark grayish brown (10YR 3/2), dark brown (10YR 4/3), and brown (10YR 5/3) layers of fine sandy loam with thin strata of sandy loam; appears massive but has bedding planes; very friable; common fine roots; moderately acid; clear wavy boundary.

C5—46 to 60 inches; brown (10YR 5/3) and pale brown (10YR 6/3) fine sandy loam with thin strata of fine sand; appears massive but has bedding planes; few fine roots; moderately acid.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. The C horizon has value of 4 or 5.

Lawson Series

The Lawson series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Lawson silt loam, occasionally flooded, in a cultivated field, 100 feet east and 100 feet south of the northwest corner of sec. 1, T. 64 N., R. 6 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A1—10 to 19 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; few fine prominent yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; clear smooth boundary.

A2—19 to 28 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; few fine prominent yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure parting to moderate medium subangular blocky; friable; common fine roots; neutral; clear smooth boundary.

A3—28 to 36 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; common medium prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; few iron and manganese oxides; few prominent organic stains; neutral; clear smooth boundary.

Cg1—36 to 44 inches; grayish brown (10YR 5/2) silt loam that has thin lenses of loam; many medium distinct yellowish brown (10YR 5/4) and few fine prominent yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; friable; few iron and manganese oxides; neutral; clear smooth boundary.

Cg2—44 to 60 inches; grayish brown (10YR 5/2) silt loam that has thin lenses of loam; many medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; few iron and manganese oxides; neutral.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Cg horizon has value of 4 or 5.

Leonard Series

The Leonard series consists of very deep, poorly drained, slowly permeable soils on uplands. These soils formed in loess and weathered glacial till. Slopes range from 3 to 9 percent.

Typical pedon of Leonard silty clay loam, 3 to 9 percent slopes, eroded, in a cultivated field, 2,100 feet west and 120 feet south of the northeast corner of sec. 19, T. 64 N., R. 9 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

Btg1—6 to 10 inches; dark grayish brown (10YR 4/2) silty clay; many medium prominent yellowish red (5YR 5/6) and red (2.5YR 4/6) mottles; weak fine subangular blocky structure; firm; many fine roots; few distinct clay films on faces of peds and in old root channels; strongly acid; clear smooth boundary.

Btg2—10 to 14 inches; grayish brown (10YR 5/2) clay; common medium prominent yellowish brown (10YR 5/4) and red (2.5YR 4/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many prominent clay films on faces of peds and in old root channels; strongly acid; gradual irregular boundary.

Btg3—14 to 22 inches; grayish brown (10YR 5/2) clay; common medium prominent strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many prominent clay films on faces of peds and in old root channels; strongly acid; gradual wavy boundary.

2Btg4—22 to 32 inches; gray (10YR 5/1) clay; common medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many faint clay films on faces of peds and in old root channels; strongly acid; gradual wavy boundary.

2Btg5—32 to 42 inches; gray (10YR 5/1) clay; common fine prominent strong brown (7.5YR 5/8) and common fine distinct yellowish brown (10YR 5/4) mottles; weak very coarse prismatic structure parting to weak fine subangular blocky; firm; few fine roots; many faint clay films on faces of peds and in old root channels; strongly acid; gradual wavy boundary.

2Btg6—42 to 55 inches; gray (10YR 6/1) clay; many medium prominent red (2.5YR 4/6 and 5/8) mottles; weak coarse prismatic structure; firm; few fine roots; few prominent clay films on faces of peds and in old root channels; strongly acid; gradual wavy boundary.

2Cg—55 to 60 inches; gray (10YR 6/1) clay; common medium prominent red (2.5YR 4/8) and dark red (2.5YR 3/6) mottles; massive; firm; strongly acid.

The A horizon has chroma of 1 or 2. The Btg horizon has value of 4 or 5 and chroma of 1 or 2.

Lindley Series

The Lindley series consists of very deep, well drained, moderately slowly permeable soils on uplands. These soils formed in glacial till. Slopes range from 14 to 40 percent.

Typical pedon of Lindley loam, 14 to 40 percent slopes, on a wooded back slope, 1,000 feet east and 100 feet north of the southwest corner of sec. 11, T. 63 N., R. 7 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary.

E—2 to 10 inches; brown (10YR 5/3) loam; weak medium platy structure parting to moderate fine and very fine granular; friable; common fine roots; 1 percent fine gravel; strongly acid; abrupt smooth boundary.

Bt1—10 to 17 inches; strong brown (7.5YR 5/6) loam; few fine faint strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds and in old root channels;

1 percent fine gravel; moderately acid; clear smooth boundary.

Bt2—17 to 25 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; common prominent clay films on faces of peds and in root channels; 1 percent fine gravel; strongly acid; clear smooth boundary.

Bt3—25 to 38 inches; strong brown (7.5YR 5/6) clay loam; moderate fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds and in root channels; 1 percent fine gravel; strongly acid; clear smooth boundary.

Bt4—38 to 45 inches; strong brown (7.5YR 5/6) clay loam; weak fine and medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds and in root channels; few fine concretions of iron and manganese oxides; 2 percent fine gravel; strongly acid; clear smooth boundary.

BC—45 to 52 inches; strong brown (7.5YR 5/6) clay loam; weak coarse prismatic structure parting to weak fine subangular blocky; firm; few fine roots; few very fine concretions of iron and manganese oxides; 5 percent fine gravel; slightly alkaline; clear smooth boundary.

Bk—52 to 60 inches; dark yellowish brown (10YR 4/6) loam; few fine prominent light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; firm; few fine roots; few fine concretions of iron and manganese oxide stains on vertical prisms of cleavages and in root channels; common medium masses of calcium carbonate; 5 percent fine gravel; strong effervescence; moderately alkaline.

The A horizon has value of 3 or 4 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

Marion Series

The Marion series consists of very deep, somewhat poorly drained, very slowly permeable soils on uplands and high stream terraces. These soils formed in loess. Slopes range from 1 to 5 percent.

Typical pedon of Marion silt loam, 1 to 5 percent slopes, in a cultivated field, 2,450 feet south and 1,950 feet west of the northeast corner of sec. 5, T. 63 N., R. 6 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 5/3) and light brownish gray (10YR 6/2) silt loam; weak thick platy structure; very friable; common fine roots; very strongly acid; clear smooth boundary.

Bt1—13 to 18 inches; yellowish brown (10YR 5/4) silty clay; common fine faint yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; many prominent clay films on faces of peds; many distinct silt coatings in crack fills on vertical faces of peds; very strongly acid; clear smooth boundary.

Bt2—18 to 27 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many distinct clay films on faces of peds; common distinct silt coatings in vertical crack fills between prisms; very strongly acid; clear smooth boundary.

Btg1—27 to 36 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and few fine prominent strong brown (7.5YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; few very fine roots; many faint clay films on faces of peds; common distinct silt coatings in vertical cracks; few fine concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

Btg2—36 to 45 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and few fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; many faint clay films on faces of peds and in old root channels; common distinct silt coatings in vertical cracks; few fine concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

Btg3—45 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and few fine prominent strong brown (7.5YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; common fine concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

Cg—52 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/8) and few fine prominent yellowish red (5YR 4/6) mottles; massive; firm; a few sand grains on faces of peds; moderately acid.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 1 to 4. The Bt horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 2. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is silt loam or silty clay loam.

Moniteau Series

The Moniteau series consists of very deep, poorly drained, moderately slowly permeable soils on high flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Moniteau silt loam, rarely flooded, in a cultivated field, 1,500 feet west and 350 feet north of the southeast corner of sec. 10, T. 64 N., R. 8 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Eg—6 to 13 inches; grayish brown (10YR 5/2) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to weak medium granular; friable; common fine roots; few fine concretions of iron and manganese oxides; few medium krotovinas; neutral; clear smooth boundary.

BEg—13 to 17 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to weak fine subangular blocky; friable; common fine roots; few fine concretions of iron and manganese oxides; many fine krotovinas; moderately acid; clear wavy boundary.

Btg1—17 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; many distinct clay films on faces of peds; many distinct silt coatings on faces of peds and in vertical fills between prisms; many prominent organic stains in vertical cracks; few soft masses of iron and manganese oxides; strongly acid; clear wavy boundary.

Btg2—26 to 36 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; many distinct clay films on faces of peds; few fine concretions of iron and manganese oxides; many prominent organic stains in vertical cracks; moderately acid; clear wavy boundary.

Btg3—36 to 48 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; many distinct clay films on faces of peds; few fine concretions of iron and manganese oxides; moderately acid; clear wavy boundary.

Btg4—48 to 55 inches; dark grayish brown (10YR 4/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) and common fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct clay films in old root channels and on faces of peds; few fine iron and manganese oxides; common distinct silt coatings in vertical cracks; moderately acid; clear wavy boundary.

Cg—55 to 60 inches; gray (5Y 5/1) fine sandy loam; many medium distinct yellowish brown (10YR 5/8) and light olive brown (2.5Y 5/6) mottles; massive; firm; few faint organic stains on faces of peds; neutral.

The solum contains 5 to 15 percent fine sand or coarser sand throughout. The A horizon has chroma of 1 to 3. The E horizon has chroma of 5 or 6 and value of 2 or less. The Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5.

Neeper Series

The Neeper series consists of very deep, well drained, moderately permeable soils on foot slopes. These soils formed in loamy colluvium and alluvium. Slopes range from 2 to 7 percent.

Typical pedon of Neeper loam, 2 to 7 percent slopes, rarely flooded, in a cultivated field, 540 feet west and 1,480 feet north of the southeast corner of sec. 8, T. 65 N., R. 6 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A1—6 to 13 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

A2—13 to 20 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; moderately acid; clear smooth boundary.

Bw1—20 to 31 inches; dark yellowish brown (10YR 3/4) clay loam; weak fine subangular blocky structure;

firm; few fine roots; moderately acid; gradual smooth boundary.

Bw2—31 to 42 inches; dark yellowish brown (10YR 4/4) clay loam; weak fine subangular blocky structure; firm; few fine roots; moderately acid; gradual smooth boundary.

Bw3—42 to 51 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; firm; very few fine roots; slightly acid; gradual smooth boundary.

BC—51 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; firm; slightly acid.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 or 5.

Nodaway Series

The Nodaway series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Nodaway silt loam, occasionally flooded, 180 feet east and 50 feet south of the northwest corner of sec. 9, T. 70 N., R. 9 W., in Van Buren County, Iowa:

A—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots throughout; horizontal cleavage planes; neutral; gradual smooth boundary.

C1—7 to 42 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) silt loam; massive; friable; few fine roots; few distinct silt coatings on faces of cleavage planes; common horizontal cleavage planes; neutral; gradual smooth boundary.

C2—42 to 60 inches; stratified very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam; massive; friable; few fine roots; few thin strata of dark grayish brown (10YR 4/2) loam; common horizontal cleavage planes; moderately acid.

The A horizon has chroma of 1 or 2. The C horizon has value of 3 to 5 and chroma of 1 to 4.

Orion Series

The Orion series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Orion silt loam, occasionally flooded, in an idle field, 2,000 feet north and 1,200 feet west of the southeast corner of sec. 16, T. 64 N., R. 7 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular and subangular blocky structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Cg1—5 to 21 inches; dark grayish brown (10YR 4/2) silt loam; common fine prominent yellowish red (5YR 4/6) and few fine distinct light gray (10YR 6/1) mottles; massive with weak bedding planes; friable; few fine roots; few thin strata of grayish brown (10YR 5/2) very fine sandy loam; neutral; clear wavy boundary.

Cg2—21 to 32 inches; dark grayish brown (10YR 4/2) silt loam; common fine prominent strong brown (7.5YR 4/6), common fine prominent reddish brown (5YR 4/3), and common fine prominent light gray (10YR 6/1) mottles; massive with thin bedding planes; friable; few fine roots; few thin strata of grayish brown (10YR 5/2) very fine sandy loam; neutral; gradual irregular boundary.

Ab1—32 to 45 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct light gray (10YR 6/1) and common fine prominent yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; neutral; gradual irregular boundary.

Ab2—45 to 60 inches; very dark gray (10YR 3/1) silty clay loam; common fine prominent strong brown (7.5YR 5/8) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; firm; neutral.

The A horizon has value of 3 or 4. The C horizon has value of 4 or 5 and chroma of 2 or 3. The Ab horizon has value of 2 or 3 and chroma of 1 or 2.

Perks Series

The Perks series consists of very deep, excessively drained, rapidly permeable soils on flood plains. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Perks loamy sand, occasionally flooded, in a cultivated field, 100 feet east and 100 feet north of the southwest corner of sec. 24, T. 64 N., R. 6 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 18 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

C1—18 to 24 inches; dark brown (10YR 4/3) loamy sand; single grain; loose; few fine roots; neutral; clear smooth boundary.

C2—24 to 36 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; few fine roots; neutral; gradual smooth boundary.

C3—36 to 48 inches; brown (7.5YR 5/4) loamy sand; single grain; loose; few fine roots; neutral; gradual smooth boundary.

C4—48 to 60 inches; light brown (7.5YR 6/4) sand; single grain; loose; neutral.

The Ap horizon has chroma of 1 to 3. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. In some pedons it has thin strata of sandy loam or loam.

Plainfield Series

The Plainfield series consists of very deep, excessively drained, rapidly permeable soils on high stream terraces. These soils formed in sandy alluvium. Slopes range from 0 to 12 percent.

Typical pedon of Plainfield loamy sand, 0 to 3 percent slopes, in a cultivated field, 1,800 feet north and 400 feet east of the southwest corner of sec. 21, T. 65 N., R. 6 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; common fine roots; strongly acid; abrupt smooth boundary.

A—10 to 20 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common fine roots; moderately acid; clear wavy boundary.

Bw—20 to 32 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few fine roots; moderately acid; clear wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; 1 percent fine gravel; moderately acid.

The A horizon has value and chroma of 2 or 3. The B horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 to 6. The content and size of sand increase with increasing depth.

Vesser Series

The Vesser series consists of very deep, poorly drained, moderately permeable soils on high flood plains and alluvial fans. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Vesser silt loam, frequently flooded, in a cultivated field, 2,400 feet east and 525 feet north of the southwest corner of sec. 34, T. 64 N., R. 8 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots; moderately acid; abrupt wavy boundary.

Eg1—11 to 16 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; common medium prominent brown (7.5YR 4/4) and common medium distinct dark yellowish brown (10YR 3/4) mottles; weak medium platy structure parting to weak very coarse angular blocky; friable; few fine roots; few fine concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

Eg2—16 to 23 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common medium prominent brown (7.5YR 4/4) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; few fine roots; common fine concretions of iron and manganese oxides; common distinct silt coatings in pores, on faces of peds, and in vertical crack fills; strongly acid; clear wavy boundary.

Eg3—23 to 31 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; many fine and coarse prominent strong brown (7.5YR 5/6) mottles; weak medium platy structure parting to weak medium subangular blocky; friable; few fine roots; few distinct clay films on faces of peds and in old root channels; common distinct silt coatings in pores and on faces of peds; common fine concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

Btg1—31 to 42 inches; grayish brown (10YR 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to weak coarse angular blocky; friable; few fine roots; few prominent clay films on faces of peds and in old root channels; many prominent silt coatings in pores and on faces of peds; common fine concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

Btg2—42 to 52 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to weak coarse angular blocky;

friable; few fine roots; few prominent clay films on faces of peds and in root channels; common distinct silt coatings in pores and on faces of peds; strongly acid; clear wavy boundary.

BC—52 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; friable; few prominent silt coatings on faces of peds; common fine concretions of iron and manganese oxides; strongly acid.

The solum contains 5 to 15 percent fine sand or coarser sand throughout. The Ap and E horizons have chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Wakeland Series

The Wakeland series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Wakeland silt loam, frequently flooded, in a cultivated field, 1,800 feet south and 1,900 feet west of the northeast corner of sec. 15, T. 63 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak very thick platy structure parting to weak very fine granular; friable; many fine roots; many distinct black organic stains; moderately acid; abrupt smooth boundary.

A—6 to 16 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; few fine roots; few faint black organic stains; moderately acid; clear smooth boundary.

Cg1—16 to 24 inches; dark grayish brown (10YR 4/2) silt loam; common fine prominent grayish brown (10YR 5/2) and few fine prominent reddish brown (5YR 4/4) mottles; massive; friable; few fine roots; few distinct silt coatings and organic stains on faces of peds; moderately acid; clear smooth boundary.

Cg2—24 to 32 inches; grayish brown (10YR 5/2) silt loam; many fine prominent dark grayish brown (10YR 4/2) and common fine prominent yellowish red (5YR 5/8) mottles; massive; friable; few fine roots; few prominent silt coatings and organic stains on faces of peds; moderately acid; clear wavy boundary.

Cg3—32 to 55 inches; dark grayish brown (10YR 4/2) silt loam; many medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; massive; friable; few fine roots; few prominent silt coatings and organic stains on faces of peds; moderately acid; clear wavy boundary.

Cg4—55 to 60 inches; grayish brown (10YR 5/2) silt loam that has thin strata of fine sandy loam; massive; friable; few distinct silt coatings and organic stains on faces of peds; slightly acid.

The A horizon has value of 4 or 5 and chroma of 2 or 3. The C horizon has chroma of 2 to 4.

Weller Series

The Weller series consists of very deep, moderately well drained, slowly permeable soils on high stream terraces. These soils formed in loess. Slopes range from 3 to 9 percent.

Typical pedon of Weller silt loam, 3 to 9 percent slopes, eroded, in a cultivated field, 150 feet west and 2,100 feet south of the northeast corner of sec. 15, T. 63 N., R. 9 W.

Ap—0 to 7 inches; mixed dark brown (10YR 4/3) and brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; moderately acid; clear smooth boundary.

Bt1—7 to 11 inches; dark brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; common medium prominent reddish brown (2.5YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine roots; few fine concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

Bt2—11 to 18 inches; dark yellowish brown (10YR 4/4) silty clay; common medium prominent yellowish red (5YR 4/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few prominent clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—18 to 26 inches; dark yellowish brown (10YR 4/4) silty clay; common medium prominent reddish brown (2.5YR 4/4) and few fine distinct grayish brown (10YR 5/2) mottles; moderate prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many faint clay films on faces of peds; many fine stains of iron and manganese oxides; strongly acid; clear wavy boundary.

Bt4—26 to 34 inches; dark yellowish brown (10YR 4/4) silty clay; many medium prominent red (2.5YR 4/6) and many coarse prominent grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; common prominent clay films in pores and on faces of peds; many fine stains of iron and manganese oxides; strongly acid; clear wavy boundary.

Bt5—34 to 52 inches; dark yellowish brown (10YR 4/4) silty clay; common medium prominent red (2.5YR 4/6) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; very few fine roots; few faint clay films on faces of peds; few fine stains of iron and manganese oxides; strongly acid; clear wavy boundary.

Btg—52 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few faint clay films on faces of peds; moderately acid.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 10YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6.

Winfield Series

The Winfield series consists of very deep, moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 5 to 12 percent.

Typical pedon of Winfield silt loam, 5 to 12 percent slopes, eroded, in a cultivated field, 750 feet north and 325 feet east of the southwest corner of sec. 16, T. 63 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; many pieces of dark yellowish brown (10YR 5/6) silt loam; weak thin platy structure parting to weak fine granular; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 20 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; few fine roots; many distinct clay films on faces of peds; few faint silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt2—20 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct clay films on faces of peds; many prominent silt coatings on faces of peds and in old root channels; very strongly acid; clear smooth boundary.

Bt3—28 to 36 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many prominent clay films on faces of peds; many prominent silt coatings on faces of peds and in old root channels; very strongly acid; clear smooth boundary.

Bt4—36 to 44 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many distinct clay films on faces of peds; common prominent silt coatings on faces of peds and in old root channels; very strongly acid; clear smooth boundary.

Bt5—44 to 52 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; few faint clay films on faces of peds; many prominent silt coatings on faces of peds and in old root channels; moderately acid; clear smooth boundary.

C—52 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; many prominent silt coatings on faces of peds; strongly acid.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 2 to 6.

Wiota Series

The Wiota series consists of very deep, well drained, moderately permeable soils on high stream terraces. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Wiota silt loam, in a cultivated field, 450 feet east and 2,550 feet south of the northwest corner of sec. 9, T. 65 N., R. 6 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—10 to 15 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak medium granular; friable; common fine roots; neutral; clear smooth boundary.

Bt1—15 to 24 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; firm; common fine roots; many faint clay films on faces of peds; few faint organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt2—24 to 33 inches; dark yellowish brown (10YR 3/4) silty clay loam; few fine faint dark brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; many prominent clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—33 to 43 inches; dark yellowish brown (10YR 3/4) silty clay loam; moderate coarse and medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Bt4—43 to 50 inches; dark yellowish brown (10YR 3/4) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; many prominent clay films on faces of peds; slightly acid; clear smooth boundary.

Bt5—50 to 60 inches; dark yellowish brown (10YR 3/4) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) and prominent brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; firm; many distinct clay films on faces of peds; few prominent silt coatings on faces of peds; slightly acid.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

Zook Series

The Zook series consists of very deep, poorly drained, slowly permeable soils on flood plains. These soils formed in silty and clayey alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Zook silty clay loam, occasionally flooded, in a cultivated field, 150 feet north and 1,350 feet west of the southeast corner of sec. 15, T. 63 N., R. 6 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; firm; many fine roots; neutral; abrupt smooth boundary.

A1—9 to 20 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; weak fine prismatic structure parting to weak medium subangular blocky; firm; many fine roots; neutral; clear wavy boundary.

A2—20 to 30 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate coarse prismatic structure parting to weak fine subangular blocky; firm; common fine roots; neutral; clear wavy boundary.

Bg1—30 to 49 inches; dark gray (10YR 4/1) silty clay; common medium prominent reddish brown (2.5YR 5/4) mottles; strong coarse prismatic structure; firm; common fine roots; few distinct organic stains in old root channels; few fine concretions of iron oxides; neutral; clear wavy boundary.

Bg2—49 to 60 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and common fine prominent yellowish red (5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few distinct organic stains; neutral.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The Bg horizon has hue of 10YR or is neutral in hue. It has value of 2 to 5 and chroma of 0 or 1.

Formation of the Soils

Soil forms through processes acting 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 material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, 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 affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always needed for the differentiation of soil horizons. Generally, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. The deposition or formation of this material is the first step in the development of a soil profile. The characteristics of this material determine the limits of chemical and mineralogical composition of the soil. The parent materials of most of the soils in Clark County were deposited by glaciers or by the meltwater from the glaciers. Some of the parent materials were subsequently reworked and redeposited by water and wind. Although the parent materials are mainly of glacial origin, their properties vary greatly, sometimes within a small area, depending on how the materials were deposited. In Clark County, five kinds of parent material, alone or in various combinations, have contributed to the formation of the soils. These are residual material weathered from shale or limestone bedrock; loess, or wind-deposited material; glacial till; glacial outwash; and alluvial material.

The residual material in Clark County weathered from shale or limestone. Bucklick soils formed in residuum derived from limestone interbedded with thin layers of shale.

Loess consists of particles that were deposited by the wind. It is made up of silt- and clay-sized particles. The principal source of loess is believed to be the flood plain along the Mississippi River and its large tributaries. These flood plains reached their greatest width after the glacier receded. The thickest deposits of loess are on the uplands and stream terraces bordering the Mississippi River flood plain in the southeastern part of the county. Winfield soils formed in the deep loess deposits. They are mostly on the east-facing slopes. Farther from the flood plain, deposits are thinner and contain more clay. In these areas, finer textured parent material and nearly level or gentle slopes have resulted in soils that have more restricted drainage characteristics. Adco, Belinda, Edina, Gorin, and Leonard soils are examples.

Glacial till is material that was laid down directly by glacial ice with a minimum of water action. It consists of particles of different sizes mixed together. The small pebbles in the glacial till have some sharp corners, indicating that they have not been worn by water. The glacial till in Clark County is calcareous, firm clay loam. Gara and Lindley soils formed in glacial till. These soils typically are loamy throughout and have well developed horizons.

Outwash material was deposited by running water from melting glaciers. The size of the particles in outwash material varies according to the velocity of the water. When rapidly moving water slowed down, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, were carried farther by the slowly moving water. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam, loamy fine sand, sand, gravel, and other coarse particles. Alvin, Gilford, Hoopeston, Jasper, and Plainfield soils formed in deposits of outwash material.

Alluvium is water-transported material deposited on the flood plains along streams, alluvial fans, and foot slopes. This material varies in texture, depending on the speed of the water from which it was deposited. The alluvial material deposited along a swift stream is coarser textured than that deposited along a slow, sluggish stream. Huntsville, Klum, Lawson, Perks, Vesser, and Wakeland soils are examples of alluvial soils.

Plant and Animal Life

Plants and animals living on or in the soil are active in the soil-forming process. Plants furnish organic matter to the soil and bring up nutrients from underlying layers to the surface layer. When these plants die and decay, they contribute organic matter to the soil. Bacteria and fungi decompose the plant remains and help to incorporate the organic matter into the soil.

The kind of native vegetation has greatly influenced soil formation in Clark County. The organic matter added to the soils under prairie grasses is largely the result of the yearly decomposition of the plant material. Plant tops decompose at the surface, but a large part of the plant material is made up of the roots, which decompose at various depths in the soil. Soils that formed under prairie grasses, therefore, have a thick, dark surface layer. Adco, Armstrong, Belinda, Colo, Edina, Gara, Hoopeston, Jasper, Leonard, Neeper, and Wiota soils are examples of soils that formed under prairie grasses.

The amount of organic matter added to soils that support woodland vegetation is less than that added to soils that formed under grasses. It is mostly the result of the decomposition of leaves and twigs on the soil surface. Thus, soils that formed under forest vegetation have a thin, dark surface layer. Alvin, Bucklick, Gorin, Keswick, Lindley, Weller, and Winfield soils are examples.

Insects, animals, and human activities also affect soil formation. Bacteria and fungi contribute more than animals do to the formation of soils. They cause the decomposition of organic material, fix nitrogen in the soil, and improve tilth. Burrowing animals and insects loosen and mix the various soil layers.

Human activities have, in a relatively short time, greatly affected the soil-forming process. Major alterations have resulted from changes in vegetation and drainage, accelerated erosion, and some urban buildup. Row crops have replaced many of the native grasses and forested areas. The changes in vegetation have affected the drainage characteristics of the soils and have increased erosion. In some parts of the county, urban development has covered areas of farmland with houses and concrete. At present, erosion continues to reduce the potential of many upland soils for cropland, except for hay or pasture crops.

Climate

Climate has an important influence on the formation of the soils. It determines the kind of plant and animal life on and in the soil. It also determines the amount of water available for the weathering of minerals and the transporting of weathered product. Through its influence on soil temperature, it determines the rate of chemical reactions in the soil.

Clark County has a midcontinental subhumid climate that has changed little during the past 5,000 years. The soils in this survey area differ from soils that formed under a dry, warm climate and from those that formed under a hot, moist climate. Although climate is uniform throughout the county, its effect is modified locally by relief and landscape position. More detailed information about the climate in Clark County is provided in the section "General Nature of the County."

Relief

Relief has had a marked effect on the soils in Clark County through its influence on natural soil drainage, runoff, erosion, plant cover, and soil temperature. The soils range from well drained on side slopes to poorly drained on broad flats or in some depressions. Through its effect on aeration, drainage helps to determine the color of the soil. Runoff is most rapid on the steeper slopes. In low areas, water can be temporarily ponded. Water and air move freely through well drained soils and slowly through poorly drained soils. In soils that are well aerated, the iron compounds that give most soils their color are brightly colored and oxidized. Poorly aerated soils are dull gray and mottled. Alvin and Neeper soils are examples of well drained, well aerated soils, and Zook soils are examples of poorly aerated, poorly drained soils.

Time

Time, usually a long time, is required for the development of distinct horizons in the parent material. Differences in the length of time that the parent materials have been in place are commonly reflected in the degree of profile development. Klum soils are an example of young soils that formed in recent alluvial material. Armstrong soils are mature soils that formed during an interglacial period more than 130,000 years ago.

Plainfield and Zook soils are older soils that show the effect of time on the leaching of lime within the soil profile. The solum of these soils originally had about as much lime as is presently in the C horizon. The Zook soils were submerged under glacial lakes or older flood plains for some time and thus were protected from leaching. In contrast, the Plainfield soils were above water and subject to leaching for much longer. The difference in time is reflected in the difference in the extent of leaching. The Plainfield soils are leached to a depth of more than 60 inches, whereas the Zook soils generally have carbonates at a depth of 24 inches.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a *percentage of the total cation-*exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chert. A hard, dense or compact, dull to semivitreous, cryptocrystalline sedimentary rock consisting of cryptocrystalline silica and lesser amounts of microcrystalline or cryptocrystalline quartz and amorphous silica.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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.

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 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Head slope. The concave surface at the head of a drainageway where the flow of water converges downward toward the center and contour lines form concave curves.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. The relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction, or any elevated area between two drainageways that shed water to them.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

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).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nose slope. The projecting end of an interfluve, where contour lines connecting the opposing side slopes form convex curves around the projecting end and lines perpendicular to the contours diverge downward. Overland flow of water is divergent.

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.

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, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, usually sharp crested with steep sides forming an extended upland between valleys.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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 substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The geomorphic component that forms the uppermost inclined surface at the top of a hillslope. It comprises the transition zone from back slope to summit of an upland. The surface is dominantly convex in profile and erosional in origin.

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.

Side slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve (e.g., shoulder). It is generally linear along the slope width, and overland flow is parallel down the slope.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The following slope classes are used in this survey:

Nearly level	0 to 2 percent
Very gently sloping	1 to 3 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 9 percent
Strongly sloping	9 to 14 percent
Moderately steep	14 to 18 percent
Steep	18 to 35 percent
Very steep	more than 35 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a ridge or hill.

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). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water break (or water bar). A hump or small dike-like surface drainage structure, properly used only in closing retired roads to traffic, on firelines, and on abandoned skid trails.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1963-93 at Keokuk, Iowa)

Month	Temperature						Precipitation			
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
January-----	33.7	16.3	25.0	62	-15	1	1.33	0.35	2.11	3
February----	38.7	20.6	29.6	67	-10	3	1.16	.58	1.66	2
March-------	51.3	31.8	41.5	81	8	48	2.77	1.43	3.94	5
April-------	64.8	43.7	54.2	87	24	193	3.58	1.95	5.02	6
May---------	74.6	53.6	64.1	91	36	442	4.61	2.32	6.60	7
June--------	83.7	62.8	73.3	97	48	702	3.78	1.60	5.62	6
July--------	87.8	67.5	77.6	101	53	801	4.61	1.80	6.96	6
August------	85.1	64.7	74.9	100	51	779	3.13	1.59	4.48	5
September---	78.2	57.0	67.6	95	37	533	4.33	2.39	6.32	6
October-----	67.0	45.6	56.3	87	27	235	3.09	1.07	4.76	5
November----	51.5	34.1	42.8	76	10	47	2.78	1.08	4.20	5
December----	37.8	21.9	29.9	65	-8	3	2.00	.85	2.98	4
Yearly:										
Average---	62.9	43.3	53.1	---	---	---	---	---	---	---
Extreme---	---	---	---	102	-16	---	---	---	---	---
Total-----	---	---	---	---	---	3,787	37.16	29.08	44.19	60

* 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 1963-93 at Keokuk, Iowa)

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. 6	Apr. 14	Apr. 19
2 years in 10 later than--	Apr. 1	Apr. 10	Apr. 16
5 years in 10 later than--	Mar. 23	Apr. 2	Apr. 9
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 30	Oct. 24	Oct. 8
2 years in 10 earlier than--	Nov. 4	Oct. 28	Oct. 14
5 years in 10 earlier than--	Nov. 13	Nov. 5	Oct. 24

TABLE 3.--GROWING SEASON

(Recorded in the period 1963-93 at Keokuk, Iowa)

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	206	195	185
8 years in 10	212	200	189
5 years in 10	225	211	198
2 years in 10	237	222	207
1 year in 10	244	228	211

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
01	Wakeland silt loam, frequently flooded	10,000	3.1
02	Klum fine sandy loam, frequently flooded	11,695	3.6
08	Huntsville silt loam, occasionally flooded	4,245	1.3
15B	Hoopeston fine sandy loam, 1 to 5 percent slopes	690	0.2
17C	Neeper loam, 2 to 7 percent slopes, rarely flooded	2,710	0.8
18B	Jasper fine sandy loam, sandy substratum, 1 to 5 percent slopes	65	*
19A	Plainfield loamy sand, 0 to 3 percent slopes	1,750	0.5
19C	Plainfield loamy sand, 3 to 12 percent slopes	500	0.2
20	Colo silty clay loam, occasionally flooded	6,065	1.8
24	Moniteau silt loam, rarely flooded	6,785	2.1
26C2	Weller silt loam, 3 to 9 percent slopes, eroded	6,445	2.0
27	Zook silty clay loam, occasionally flooded	12,135	3.7
29F	Lindley loam, 14 to 40 percent slopes	47,100	14.4
31C2	Armstrong loam, 5 to 12 percent slopes, eroded	35,805	10.9
31E2	Armstrong loam, 12 to 18 percent slopes, eroded	21,295	6.5
32F2	Gara loam, 18 to 30 percent slopes, eroded	11,340	3.5
33	Edina silt loam	9,620	2.9
35C2	Gorin silt loam, 3 to 9 percent slopes, eroded	14,710	4.5
37B	Marion silt loam, 1 to 5 percent slopes	2,390	0.7
39C2	Keswick loam, 5 to 12 percent slopes, eroded	6,525	2.0
39E2	Keswick loam, 12 to 18 percent slopes, eroded	15,905	4.9
41C2	Leonard silty clay loam, 3 to 9 percent slopes. eroded	13,190	4.0
43B	Adco silt loam, 1 to 5 percent slopes	41,650	12.7
44	Belinda silt loam	5,845	1.8
45F	Bucklick silt loam, 18 to 35 percent slopes	4,395	1.3
47C2	Winfield silt loam, 5 to 12 percent slopes, eroded	4,385	1.3
48C	Alvin fine sandy loam, 3 to 9 percent slopes	340	0.1
49	Vesser silt loam, occasionally flooded	7,170	2.2
50	Pits, quarries	1,745	0.5
51	Gilford sandy loam, occasionally flooded	1,550	0.5
53	Vesser silt loam, frequently flooded	4,150	1.3
54	Zook silty clay loam, frequently flooded	435	0.1
60	Excello clay loam, occasionally flooded	1,750	0.5
66	Nodaway silt loam, occasionally flooded	40	*
71	Beaucoup silt loam, occasionally flooded	5,665	1.7
74	Orion silt loam, occasionally flooded	900	0.3
82	Lawson silt loam, occasionally flooded	1,270	0.4
90	Perks loamy sand, occasionally flooded	3,330	1.0
91	Wiota silt loam	200	0.1
99	Fatima silt loam, frequently flooded	1,470	0.4
	Water areas more than 40 acres in size	655	0.2
	Total	327,910	100.0

* Less than 0.05 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
01	Wakeland silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
02	Klum fine sandy loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
08	Huntsville silt loam, occasionally flooded
15B	Hoopeston fine sandy loam, 1 to 5 percent slopes
17C	Neeper loam, 2 to 7 percent slopes, rarely flooded
18B	Jasper fine sandy loam, sandy substratum, 1 to 5 percent slopes
20	Colo silty clay loam, occasionally flooded (where drained)
24	Moniteau silt loam, rarely flooded (where drained)
27	Zook silty clay loam, occasionally flooded (where drained)
33	Edina silt loam (where drained)
37B	Marion silt loam, 1 to 5 percent slopes
43B	Adco silt loam, 1 to 5 percent slopes
44	Belinda silt loam (where drained)
48C	Alvin fine sandy loam, 3 to 9 percent slopes
49	Vesser silt loam, occasionally flooded (where drained)
51	Gilford sandy loam, occasionally flooded (where drained)
53	Vesser silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
54	Zook silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
60	Excello clay loam, occasionally flooded (where drained)
66	Nodaway silt loam, occasionally flooded
71	Beaucoup silt loam, occasionally flooded (where drained)
74	Orion silt loam, occasionally flooded
82	Lawson silt loam, occasionally flooded (where drained)
90	Perks loamy sand, occasionally flooded
91	Wiota silt loam
99	Fatima silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)

TABLE 6.--LAND CAPABILITY 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	Grain sorghum	Winter wheat	Bromegrass-alfalfa hay	Orchard-grass-red clover hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
01---------------- Wakeland	IIIw	107	36	85	43	---	3.6	5.7
02---------------- Klum	IIIw	64	23	55	27	---	2.4	3.5
08---------------- Huntsville	IIw	123	41	98	50	---	4.3	6.4
15B--------------- Hoopeston	IIe	98	33	---	40	3.4	3.2	5.1
17C--------------- Neeper	IIe	135	45	106	54	4.5	4.3	6.7
18B--------------- Jasper	IIe	125	41	96	48	4.2	4.0	6.2
19A--------------- Plainfield	IVs	---	---	35	20	---	1.3	2.0
19C--------------- Plainfield	IVe	45	18	30	15	---	1.0	2.0
20---------------- Colo	IIw	123	41	98	50	---	4.3	6.4
24---------------- Moniteau	IIIw	98	33	72	40	---	3.2	5.1
26C2-------------- Weller	IIIe	93	31	73	37	---	3.2	4.7
27---------------- Zook	IIw	96	31	75	38	---	3.2	4.7
29F--------------- Lindley	VIe	---	---	---	---	---	---	4.3
31C2-------------- Armstrong	IIIe	93	31	73	37	---	3.2	4.7
31E2-------------- Armstrong	VIe	---	---	---	---	---	2.5	3.7
32F2-------------- Gara	VIe	---	---	---	---	---	---	4.2
33---------------- Edina	IIw	113	37	89	46	---	3.8	5.6
35C2-------------- Gorin	IIIe	85	29	68	35	---	2.9	4.2
37B--------------- Marion	IIIe	96	31	75	37	---	3.2	4.7

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Bromegrass-alfalfa hay	Orchard-grass-red clover hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
39C2------------ Keswick	IIIe	93	31	73	37	---	3.2	4.7
39E2------------ Keswick	VIe	---	---	---	---	---	2.5	3.7
41C2------------ Leonard	IIIe	86	28	70	34	---	3.0	5.5
43B------------- Adco	IIe	107	36	84	43	---	3.5	5.7
44-------------- Belinda	IIw	107	36	85	43	---	3.5	5.7
45F------------- Bucklick	VIIe	---	---	---	---	---	---	3.0
47C2------------ Winfield	IIIe	113	37	89	46	3.8	3.6	5.8
48C------------- Alvin	IIIe	75	25	59	30	2.5	2.3	3.7
49-------------- Vesser	IIw	113	37	46	89	---	3.7	5.6
50. Pits								
51-------------- Gilford	IIw	98	33	72	44	4.0	3.2	5.1
53-------------- Vesser	IIIw	96	31	75	37	---	3.2	4.7
54-------------- Zook	IIIw	77	26	62	31	---	2.6	4.0
60-------------- Excello	IIw	120	40	94	48	---	4.0	6.0
66-------------- Nodaway	IIw	123	41	96	50	4.2	4.0	6.1
71-------------- Beaucoup	IIw	130	44	103	52	---	4.4	6.5
74-------------- Orion	IIw	125	41	99	50	4.5	4.3	6.3
82-------------- Lawson	IIw	135	45	106	54	---	4.5	6.8
90-------------- Perks	IVs	---	---	40	20	---	1.8	2.3
91-------------- Wiota	I	135	45	106	54	4.6	4.4	6.9

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Bromegrass-alfalfa hay	Orchard-grass-red clover hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
99-------------- Fatima	IIIw	115	38	90	46	---	3.7	5.8

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--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	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
01-------------- Wakeland	5W	Slight	Moderate	Slight	Slight	Pin oak-------------	90	72	Eastern white pine, American sycamore, white ash, pin oak.
						Green ash-----------	93	70	
						Hackberry-----------	73	---	
08-------------- Huntsville	11A	Slight	Slight	Slight	Slight	Eastern cottonwood--	110	156	Eastern cottonwood, American sycamore, green ash, black walnut.
						American sycamore---	---	---	
						Green ash-----------	---	---	
19A, 19C-------- Plainfield	3S	Slight	Slight	Moderate	Slight	Black oak-----------	56	37	Red pine, black oak, eastern white pine.
						White oak-----------	55	---	
						Blackjack oak-------	---	---	
24-------------- Moniteau	4W	Slight	Severe	Moderate	Moderate	Pin oak-------------	70	52	White oak, pin oak, green ash, eastern cottonwood, silver maple.
26C2------------ Weller	3C	Slight	Slight	Severe	Slight	White oak-----------	47	38	Eastern white pine, black oak, northern red oak.
						Northern red oak----	60	43	
						Black oak-----------	---	---	
						Post oak------------	---	---	
29F------------- Lindley	3R	Moderate	Moderate	Slight	Slight	White oak-----------	56	39	White oak, northern red oak, black oak.
						Northern red oak----	61	44	
						Black oak-----------	63	46	
						Sugar maple---------	---	---	
31C2------------ Armstrong	3C	Slight	Slight	Moderate	Slight	White oak-----------	58	38	Eastern white pine, black oak.
						Northern red oak----	---	---	
						Black oak-----------	66	48	
						Shagbark hickory----	---	---	
31E2------------ Armstrong	3R	Moderate	Moderate	Moderate	Slight	White oak-----------	58	38	Eastern white pine, black oak.
						Northern red oak----	---	---	
						Black oak-----------	66	48	
						Shagbark hickory----	---	---	
32F2------------ Gara	3R	Moderate	Moderate	Slight	Slight	White oak-----------	56	38	White oak, northern red oak, eastern white pine.
						Northern red oak----	57	40	
						Black oak-----------	66	48	
						Post oak------------	---	---	
						Shagbark hickory----	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
35C2------------ Gorin	3C	Slight	Slight	Moderate	Slight	White oak-----------	53	38	White oak, northern red oak, black oak.
						Black oak-----------	61	44	
						Northern red oak----	62	45	
						Shagbark hickory----	---	---	
37B------------- Marion	2W	Slight	Severe	Moderate	Severe	White oak-----------	50	34	Black oak, pin oak, green ash.
						Post oak------------	---	---	
						Black oak-----------	57	40	
						Shagbark hickory----	---	---	
39C2------------ Keswick	3C	Slight	Slight	Moderate	Slight	White oak-----------	57	43	Eastern white pine, black oak.
						Post oak------------	54	38	
						Black oak-----------	62	45	
						Shagbark hickory----	---	---	
39E2------------ Keswick	3R	Moderate	Moderate	Moderate	Slight	White oak-----------	57	40	Eastern white pine, black oak.
						Post oak------------	54	38	
						Black oak-----------	62	45	
						Shagbark hickory----	---	---	
44-------------- Belinda	2W	Slight	Severe	Moderate	Moderate	White oak-----------	45	30	Black oak, pin oak.
						Black oak-----------	---	---	
45F------------- Bucklick	3R	Moderate	Moderate	Slight	Slight	White oak-----------	61	44	White oak, eastern white pine.
						Northern red oak----	---	---	
						Black oak-----------	---	---	
						Sugar maple---------	---	---	
						Post oak------------	---	---	
47C2------------ Winfield	3A	Slight	Slight	Slight	Slight	White oak-----------	60	43	Green ash, white oak, northern red oak, black oak.
						Northern red oak----	65	48	
						Black oak-----------	65	48	
48C------------- Alvin	4A	Slight	Slight	Slight	Slight	White oak-----------	72	54	Green ash, black walnut, white oak, eastern white pine.
						Northern red oak----	75	57	
						Black walnut--------	---	---	
51-------------- Gilford	3W	Slight	Severe	Severe	Severe	Pin oak-------------	65	52	Green ash, pin oak, baldcypress.
						Bur oak-------------	---	---	
						Silver maple--------	80	34	
66-------------- Nodaway	3A	Slight	Slight	Slight	Slight	White oak-----------	65	48	Eastern white pine, black walnut, white oak.
						Pin oak-------------	---	---	
71-------------- Beaucoup	5W	Slight	Severe	Moderate	Moderate	Pin oak-------------	90	72	Eastern cottonwood, American sycamore, pin oak.
						Eastern cottonwood--	100	128	
						American sycamore---	---	---	
74-------------- Orion	2W	Slight	Moderate	Slight	Slight	Silver maple--------	80	34	White ash, eastern cottonwood.
						White ash-----------	---	---	

See footnote at end of table.

TABLE 7.--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*	
82 Lawson	2A	Slight	Slight	Slight	Slight	Silver maple White ash	70 ---	25 ---	Eastern cottonwood, white ash.
90 Perks	3S	Slight	Slight	Moderate	Slight	White oak	55	38	Eastern white pine.
99 Fatima	5W	Slight	Moderate	Slight	Slight	Pin oak Black walnut Bur oak	86 --- ---	68 --- ---	Pin oak, black walnut, pecan, eastern cottonwood, 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 8.--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
01. Wakeland	---	Arrowwood, American plum, American cranberrybush, silky dogwood.	Northern whitecedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
02. Klum	---	Arrowwood, American plum, American cranberrybush, silky dogwood.	Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
08. Huntsville	---	Arrowwood, American plum, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
15B. Hoopeston	---	Arrowwood, American plum, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
17C. Neeper	---	American cranberrybush, arrowwood, American plum, silky dogwood.	Washington hawthorn, blue spruce, northern whitecedar, white fir.	Austrian pine, eastern white pine, Norway spruce.	Pin oak.
18B. Jasper	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
19A, 19C. Plainfield	Lilac	Eastern redcedar, radiant crabapple, Washington hawthorn, gray dogwood.	Red pine, Austrian pine.	Eastern white pine	---
20. Colo	---	American cranberrybush, silky dogwood, deciduous holly, green haw.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 8.--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
24 Moniteau	Buttonbush, redosier dogwood.	Plum, deciduous holly, green haw.	Green ash, northern whitecedar, white spruce, hackberry, Austrian pine.	Pin oak	---
26C2 Weller	---	Ninebark, arrowwood, Washington hawthorn, deciduous holly, green haw.	Green ash, Austrian pine, eastern redcedar.	Eastern white pine, pin oak.	---
27 Zook	---	Silky dogwood, American cranberrybush, deciduous holly, green haw.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
29F Lindley	Fragrant sumac, redosier dogwood.	American plum, arrowwood, silky dogwood.	Washington hawthorn.	Green ash, Douglas-fir, northern red oak, pin oak, white fir.	Eastern white pine.
31C2, 31E2 Armstrong	---	Washington hawthorn, arrowwood, ninebark.	Austrian pine, green ash, eastern redcedar.	Eastern white pine, pin oak.	---
32F2 Gara	---	American cranberrybush, silky dogwood, American plum.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
33 Edina	Redosier dogwood	Silky dogwood, American cranberrybush, deciduous holly, green ash.	Washington hawthorn, Austrian pine, green ash, northern whitecedar.	Eastern white pine, red maple.	Pin oak.
35C2 Gorin	Fragrant sumac	Amur maple, gray dogwood, ninebark.	Hackberry, eastern redcedar, Virginia pine, Norway spruce.	Honeylocust, pin oak.	---
37B Marion	---	Ninebark, American cranberrybush, Washington hawthorn, arrowwood.	Austrian pine, green ash, eastern redcedar.	Eastern white pine, pin oak.	---

TABLE 8.--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
39C2, 39E2: Keswick	---	American cranberrybush, Washington hawthorn, arrowwood, ninebark.	Austrian pine, green ash, eastern redcedar.	Eastern white pine, pin oak.	---
41C2: Leonard	Fragrant sumac	Amur maple	Hackberry, eastern redcedar, Norway spruce.	Pin oak, Austrian pine, honeylocust.	---
43B: Adco	Fragrant sumac	Amur maple, gray dogwood, ninebark.	Hackberry, eastern redcedar, Norway spruce, Virginia pine.	Honeylocust, pin oak.	---
44: Belinda	---	Silky dogwood, American cranberrybush, deciduous holly, green haw.	Austrian pine, Norway spruce, blue spruce, northern whitecedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
45F: Bucklick	Fragrant sumac, redosier dogwood.	Silky dogwood, American plum, arrowwood.	Blue spruce, hackberry, Washington hawthorn.	Norway spruce, green ash, eastern white pine.	Pin oak.
47C2: Winfield	Redosier dogwood, fragrant sumac.	Silky dogwood, American plum, arrowwood.	Washington hawthorn.	Green ash, Douglas-fir, sweetgum, northern red oak, white fir.	Eastern white pine.
48C: Alvin	---	Washington hawthorn, American cranberrybush, silky dogwood.	Austrian pine, northern whitecedar, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
49: Vesser	---	American cranberrybush, silky dogwood, deciduous holly, green haw.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
50. Pits					
51: Gilford	---	Silky dogwood, American cranberrybush, deciduous holly, green haw.	Norway spruce, northern whitecedar, Washington hawthorn, blue spruce, white fir, Austrian pine.	Eastern white pine	Pin oak.

TABLE 8.--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
53. Vesser	---	American cranberrybush, silky dogwood, deciduous holly, green haw.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
54. Zook	---	Silky dogwood, American cranberrybush, deciduous holly, green haw.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
60. Excello	Buttonbush, redosier dogwood.	---	Northern whitecedar, nannyberry viburnum, green ash, blue spruce.	Pin oak, baldcypress.	Eastern cottonwood.
66. Nodaway	---	American cranberrybush, silky dogwood, deciduous holly, green haw.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
71. Beaucoup	---	Silky dogwood, American cranberrybush, deciduous holly, green haw.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
74. Orion	---	American cranberrybush, silky dogwood, arrowwood, American plum.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
82. Lawson	---	American cranberrybush, silky dogwood, arrowwood, American plum.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
90. Perks	---	Silky dogwood, American cranberrybush, arrowwood, American plum.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.

TABLE 8.--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
91----------------- Wiota	---	Silky dogwood, American cranberrybush, arrowwood, American plum.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
99----------------- Fatima	Fragrant sumac----	American plum, blackhaw, silky dogwood.	Nannyberry viburnum, white fir, Washington hawthorn.	Green ash, eastern white pine, Norway spruce.	Pin oak, eastern cottonwood.

TABLE 9.--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
01 Wakeland	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
02 Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
08 Huntsville	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
15B Hoopeston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
17C Neeper	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
18B Jasper	Slight	Slight	Moderate: slope.	Slight	Slight.
19A Plainfield	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
19C Plainfield	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
20 Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
24 Moniteau	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
26C2 Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
27 Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
29F Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
31C2 Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
31E2 Armstrong	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: wetness, slope.	Severe: slope.
32F2 Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
33. Edina	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
35C2. Gorin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness.
37B. Marion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
39C2. Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
39E2. Keswick	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.
41C2. Leonard	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.
43B. Adco	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
44. Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
45F. Bucklick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
47C2. Winfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
48C. Alvin	Slight	Slight	Severe: slope.	Slight	Slight.
49. Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
50. Pits					
51. Gilford	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
53. Vesser	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
54. Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
60----------------------- Excello	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
66----------------------- Nodaway	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
71----------------------- Beaucoup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
74----------------------- Orion	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
82----------------------- Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
90----------------------- Perks	Severe: flooding.	Slight----------	Slight----------	Slight----------	Severe: droughty.
91----------------------- Wiota	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
99----------------------- Fatima	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

TABLE 10.--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
01 Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
02 Klum	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
08 Huntsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
15B Hoopeston	Fair	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
17C Neeper	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
18B Jasper	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
19A Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
19C Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
20 Colo	Fair	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
24 Moniteau	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair.
26C2 Weller	Fair	Good	Good	Good	Fair	Very poor.	Poor	Good	Good	Very poor.
27 Zook	Fair	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
29F Lindley	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
31C2 Armstrong	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
31E2 Armstrong	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
32F2 Gara	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
33 Edina	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
35C2 Gorin	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
37B Marion	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.

TABLE 10.--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
39C2 Keswick	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
39E2 Keswick	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
41C2 Leonard	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
43B Adco	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
44 Belinda	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
45F Bucklick	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
47C2 Winfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48C Alvin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
49 Vesser	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
50. Pits										
51 Gilford	Fair	Fair	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
53 Vesser	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
54 Zook	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
60 Excello	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair.
66 Nodaway	Good	Good	Good	Good	Good	Fair	Poor	Fair	Good	Fair.
71 Beaucoup	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
74 Orion	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Good.
82 Lawson	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
90 Perks	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
91 Wiota	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

TABLE 10.--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
99-----------------Fatima	Poor	Poor	Good	Good	Good	Poor	Poor	Fair	Good	Poor.

TABLE 11.--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
01---------------- Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
02---------------- Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
08---------------- Huntsville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
15B--------------- Hoopeston	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
17C--------------- Neeper	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
18B--------------- Jasper	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
19A--------------- Plainfield	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
19C--------------- Plainfield	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
20---------------- Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
24---------------- Moniteau	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
26C2-------------- Weller	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
27---------------- Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
29F--------------- Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
31C2-------------- Armstrong	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.

TABLE 11.--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
31E2-------------- Armstrong	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
32F2-------------- Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
33---------------- Edina	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
35C2-------------- Gorin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
37B--------------- Marion	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
39C2-------------- Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
39E2-------------- Keswick	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
41C2-------------- Leonard	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
43B--------------- Adco	Moderate: too clayey, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
44---------------- Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
45F--------------- Bucklick	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
47C2-------------- Winfield	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
48C--------------- Alvin	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.

TABLE 11.--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
49----------------Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
50. Pits						
51----------------Gilford	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding.
53----------------Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
54----------------Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding.
60----------------Excello	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
66----------------Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
71----------------Beaucoup	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.
74----------------Orion	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
82----------------Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
90----------------Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
91----------------Wiota	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
99----------------Fatima	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.

TABLE 12.--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
01------------------ Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
02------------------ Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
08------------------ Huntsville	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
15B----------------- Hoopeston	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
17C----------------- Neeper	Moderate: flooding, wetness, percs slowly.	Moderate: seepage, slope, wetness.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
18B----------------- Jasper	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey, thin layer.
19A----------------- Plainfield	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
19C----------------- Plainfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
20------------------ Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
24------------------ Moniteau	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
26C2---------------- Weller	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
27------------------ Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
29F----------------- Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
31C2 Armstrong	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
31E2 Armstrong	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
32F2 Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
33 Edina	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
35C2 Gorin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
37B Marion	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
39C2 Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
39E2 Keswick	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
41C2 Leonard	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
43B Adco	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
44 Belinda	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
45F Bucklick	Severe: slope.	Severe: slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: too clayey, slope.
47C2 Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
48C Alvin	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
49------------------ Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
50. Pits					
51------------------ Gilford	Severe: flooding, ponding.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
53------------------ Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
54------------------ Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
60------------------ Excello	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
66------------------ Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
71------------------ Beaucoup	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
74------------------ Orion	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
82------------------ Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
90------------------ Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
91------------------ Wiota	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
99------------------ Fatima	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

TABLE 13.--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
01 Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
02 Klum	Good	Probable	Improbable: too sandy.	Good.
08 Huntsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
15B Hoopeston	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, thin layer.
17C Neeper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18B Jasper	Good	Probable	Improbable: too sandy.	Good.
19A, 19C Plainfield	Good	Probable	Improbable: too sandy.	Poor: too sandy.
20 Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
24 Moniteau	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
26C2 Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
27 Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
29F Lindley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
31C2 Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
31E2 Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
32F2 Gara	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
33 Edina	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
35C2: Gorin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
37B: Marion	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
39C2: Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
39E2: Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
41C2: Leonard	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
43B: Adco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
44: Belinda	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
45F: Bucklick	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim, slope.
47C2: Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
48C: Alvin	Good	Probable	Improbable: too sandy.	Poor: too sandy.
49: Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
50. Pits				
51: Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
53: Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54: Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
60: Excello	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
66: Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
71 Beaucoup	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
74 Orion	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
82 Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
90 Perks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
91 Wiota	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
99 Fatima	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--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	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
01: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
02: Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
08: Huntsville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
15B: Hoopeston	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, slope, cutbanks cave.	Slope, wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
17C: Neeper	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
18B: Jasper	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
19A: Plainfield	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
19C: Plainfield	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
20: Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
24: Moniteau	Slight	Severe: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
26C2: Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
27: Zook	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
29F: Lindley	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
31C2, 31E2: Armstrong	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
32F2: Gara	Severe: slope.	Slight	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
33 Edina	Slight	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
35C2 Gorin	Moderate: slope.	Moderate: thin layer, hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
37B Marion	Moderate: slope.	Moderate: wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
39C2, 39E2 Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
41C2 Leonard	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
43B Adco	Slight	Severe: hard to pack.	Percs slowly, frost action.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
44 Belinda	Slight	Severe: wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
45F Bucklick	Severe: slope.	Moderate: thin layer.	Deep to water	Slope	Slope	Slope.
47C2 Winfield	Severe: slope.	Moderate: thin layer, wetness.	Frost action, slope.	Slope, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
48C Alvin	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
49 Vesser	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
50. Pits						
51 Gilford	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, frost action.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
53 Vesser	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
54 Zook	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
60 Excello	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
66---------------- Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-------	Erodes easily	Erodes easily.
71---------------- Beaucoup	Slight---------	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding--------	Wetness.
74---------------- Orion	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
82---------------- Lawson	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
90---------------- Perks	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
91---------------- Wiota	Moderate: seepage.	Slight---------	Deep to water	Favorable------	Erodes easily	Erodes easily.
99---------------- Fatima	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Deep to water	Flooding-------	Favorable------	Favorable.

TABLE 15.--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 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
01--------------- Wakeland	0-16	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	16-60	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
02--------------- Klum	0-7	Fine sandy loam	CL-ML, SC-SM	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	7-60	Stratified silt loam to sandy loam.	CL-ML, SP-SM, SC-SM	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
08--------------- Huntsville	0-26	Silt loam--------	CL	A-6	0	100	98-100	90-100	85-100	25-40	10-25
	26-60	Silt loam, loam, sandy loam.	CL, ML, SM, SC	A-4, A-6	0	90-100	80-100	55-95	45-85	20-35	NP-15
15B-------------- Hoopeston	0-16	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	90-100	90-100	70-90	25-45	<25	NP-10
	16-43	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-2, A-4	0	90-100	90-100	60-85	25-50	<30	NP-10
	43-60	Loamy sand, sand, fine sand.	SP-SM, SM, SC, SC-SM	A-2, A-3	0	90-100	90-100	50-80	5-20	<25	NP-10
17C-------------- Neeper	0-20	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-75	16-30	5-12
	20-51	Clay loam, silt loam, loam.	CL	A-4, A-6	0	100	100	80-95	60-85	25-40	8-20
	51-60	Loam, clay loam, silt loam.	CL	A-4, A-6	0	100	100	80-95	60-85	25-40	8-20
18B-------------- Jasper	0-16	Fine sandy loam	SC-SM, SC, CL-ML, CL	A-4, A-6	0	100	100	70-85	40-55	<25	4-15
	16-34	Silt loam, loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	15-35	4-15
	34-54	Loam, clay loam, sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	100	100	60-100	35-85	20-35	5-20
	54-60	Loamy sand, sand	SM, SP-SM, SC, SC-SM	A-2-4, A-3	0	100	100	50-75	5-30	<25	NP-10
19A, 19C--------- Plainfield	0-32	Loamy sand-------	SM, SP-SM	A-2, A-4, A-1	0	95-100	95-100	40-90	12-30	---	NP
	32-60	Sand-------------	SP, SM, SP-SM	A-3, A-1, A-2	0	95-100	95-100	40-70	1-15	---	NP
20--------------- Colo	0-18	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	18-50	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	50-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
24--------------- Moniteau	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	6-17	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	17-55	Silty clay loam	CL	A-6, A-7	0	100	100	85-100	80-95	30-45	15-25
	55-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	75-100	25-40	5-15
26C2------------- Weller	0-7	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	7-52	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	52-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	10-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
27---------------- Zook	0-9	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	9-49	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	49-60	Silty clay, silty clay loam, silt loam.	CH, CL, ML	A-6, A-7	0	100	100	95-100	95-100	35-85	10-50
29F--------------- Lindley	0-10	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
	10-45	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	45-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
31C2, 31E2-------- Armstrong	0-7	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	90-100	75-90	55-80	20-30	5-15
	7-56	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	85-90	70-90	55-80	45-70	20-35
	56-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-20
32F2-------------- Gara	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-100	75-85	55-70	20-30	5-15
	6-44	Clay loam, loam	CL	A-6	0-5	90-95	85-100	70-85	55-75	30-40	15-25
	44-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-100	70-85	55-75	35-45	15-25
33---------------- Edina	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	12-20	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	20-42	Silty clay, clay	CH	A-7	0	100	100	95-100	90-100	55-75	30-45
	42-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	90-100	35-60	15-35
35C2-------------- Gorin	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-18
	5-8	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-30
	8-32	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	32-42	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	80-95	70-90	30-50	12-30
	42-60	Loam, silt loam	CL	A-4, A-6	0	100	95-100	85-100	65-90	25-35	8-15
37B--------------- Marion	0-13	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	90-100	30-40	5-15
	13-27	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	27-52	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	20-25
	52-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-25
39C2, 39E2-------- Keswick	0-7	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	7-46	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	46-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
41C2-------------- Leonard	0-6	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	30-45	15-25
	6-10	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	20-30
	10-60	Silty clay, clay, silty clay loam.	CH	A-7	0	100	95-100	85-100	80-100	55-70	30-40
43B--------------- Adco	0-8	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	13-25
	8-14	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	30-45	13-25
	14-33	Silty clay-------	CH	A-7	0	100	100	100	95-100	66-76	41-49
	33-56	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	90-100	43-66	22-41
	56-60	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-100	31-51	13-29

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
44-------------- Belinda	0-8	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	8-16	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	100	95-100	25-35	5-10
	16-31	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	40-55	20-30
	31-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
45F------------- Bucklick	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	10-31	Silty clay loam, silty clay, clay loam.	CL	A-7	0	95-100	85-100	80-100	65-95	40-50	20-30
	31-46	Very gravelly silty clay, gravelly silty clay loam, silty clay.	CL, SC, GC	A-7	0-15	40-100	35-100	35-100	30-95	40-50	20-30
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
47C2------------ Winfield	0-8	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	8-20	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-45	15-25
	20-44	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	44-70	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
48C------------- Alvin	0-15	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	15-36	Very fine sandy loam, sandy loam, loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	70-100	20-80	15-40	NP-15
	36-60	Very fine sand, fine sandy loam, loamy fine sand.	SP, SP-SM, SM	A-2, A-3, A-1	0	95-100	90-100	45-95	4-35	<20	NP-4
49-------------- Vesser	0-15	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	15-24	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	24-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
50. Pits											
51-------------- Gilford	0-15	Sandy loam-------	SM	A-2-4	0	100	100	70-90	20-30	---	NP
	15-49	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-2-4	0	95-100	95-100	55-70	20-35	15-30	NP-8
	49-60	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1-B, A-2-4	0	95-100	95-100	18-60	3-20	---	NP
53-------------- Vesser	0-11	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	11-31	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	31-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
54-------------- Zook	0-9	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	9-49	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	49-60	Silty clay, silty clay loam, silt loam.	CH, CL, ML	A-6, A-7	0	100	100	95-100	95-100	35-85	10-50

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
60---------------- Excello	0-14	Clay loam--------	CL	A-7	0	100	100	90-100	70-80	40-50	15-25
	14-41	Loam, clay loam, sandy clay loam.	CL	A-6, A-7	0	100	100	80-100	50-80	30-50	11-30
	41-60	Loam, clay loam, sandy clay loam.	CL	A-6, A-7	0	100	100	80-100	50-80	30-50	11-30
66---------------- Nodaway	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
71---------------- Beaucoup	0-15	Silt loam--------	CL, ML	A-6	0	100	100	90-100	80-100	30-40	10-20
	15-60	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
74---------------- Orion	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-35	4-12
	5-32	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	100	100	90-100	70-80	20-30	4-10
	32-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	85-100	85-100	20-40	4-18
82---------------- Lawson	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	10-28	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	28-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-100	20-45	10-25
90---------------- Perks	0-18	Loamy sand-------	SM, SP, SP-SM	A-1	0	95-100	95-100	30-50	3-20	---	NP
	18-60	Sand, loamy sand, loamy fine sand.	SM, SP, SP-SM	A-1	0	95-100	95-100	30-50	3-20	---	NP
91---------------- Wiota	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	90-95	25-35	5-15
	15-60	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	15-25
99---------------- Fatima	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	65-90	25-40	5-18
	13-32	Silt loam--------	CL	A-6	0	100	100	95-100	80-90	30-40	12-18
	32-60	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	65-90	25-40	5-18

TABLE 16.--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
01---------------- Wakeland	0-16	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-2
	16-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
02---------------- Klum	0-7	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low-----------	0.20	5	3	1-2
	7-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low-----------	0.24			
08---------------- Huntsville	0-26	18-27	1.15-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Moderate-----	0.28	5	6	2-4
	26-60	15-25	1.20-1.50	0.6-2.0	0.12-0.21	6.1-7.8	Low-----------	0.43			
15B--------------- Hoopeston	0-16	8-18	1.35-1.70	2.0-6.0	0.12-0.15	5.1-6.5	Low-----------	0.20	4	3	2-3
	16-43	12-18	1.45-1.70	2.0-6.0	0.12-0.17	5.1-7.8	Low-----------	0.28			
	43-60	2-10	1.50-1.70	6.0-20	0.05-0.10	4.5-8.4	Low-----------	0.17			
17C--------------- Neeper	0-20	10-27	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.28	5	6	2-4
	20-51	18-35	1.20-1.40	0.6-2.0	0.16-0.20	5.6-6.5	Moderate-----	0.43			
	51-60	18-35	1.20-1.40	0.6-2.0	0.14-0.20	5.6-6.5	Moderate-----	0.43			
18B--------------- Jasper	0-16	10-20	1.30-1.50	2.0-6.0	0.16-0.18	5.6-7.3	Low-----------	0.20	5	3	2-4
	16-34	10-22	1.35-1.55	0.6-2.0	0.17-0.22	5.1-7.3	Low-----------	0.28			
	34-54	20-32	1.40-1.60	0.6-2.0	0.13-0.19	5.1-6.5	Low-----------	0.28			
	54-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	Low-----------	0.17			
19A, 19C---------- Plainfield	0-32	3-7	1.50-1.65	6.0-20	0.09-0.12	4.5-7.3	Low-----------	0.17	5	2	.5-1
	32-60	0-4	1.50-1.65	6.0-20	0.04-0.07	4.5-7.3	Low-----------	0.17			
20---------------- Colo	0-18	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	4-6
	18-50	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	50-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.32			
24---------------- Moniteau	0-6	18-27	1.20-1.40	0.6-2.0	0.21-0.23	5.6-7.3	Low-----------	0.37	5	6	1-2
	6-17	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.43			
	17-55	27-35	1.30-1.50	0.2-0.6	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	55-60	18-30	1.25-1.45	0.2-0.6	0.20-0.22	4.5-6.5	Low-----------	0.43			
26C2-------------- Weller	0-7	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	6	1-2
	7-52	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43			
	52-60	25-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.5	High----------	0.43			
27---------------- Zook	0-9	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High----------	0.28	5	4	4-6
	9-49	35-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.3	High----------	0.28			
	49-60	25-45	1.30-1.45	0.06-0.2	0.11-0.20	5.6-7.3	High----------	0.28			
29F--------------- Lindley	0-10	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low-----------	0.32	5	6	1-2
	10-45	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32			
	45-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32			
31C2, 31E2-------- Armstrong	0-7	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32	3	6	2-3
	7-56	27-50	1.55-1.60	0.06-0.2	0.11-0.16	4.5-6.5	High----------	0.32			
	56-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.8	Moderate-----	0.32			
32F2-------------- Gara	0-6	18-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	5	6	2-3
	6-44	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.32			
	44-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.6-8.4	Moderate-----	0.37			
33---------------- Edina	0-12	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.37	3	6	2-4
	12-20	15-27	1.35-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.37			
	20-42	45-60	1.30-1.45	0.00-0.06	0.11-0.13	5.1-7.3	Very high----	0.37			
	42-60	27-40	1.35-1.50	0.06-0.2	0.18-0.20	6.1-7.3	High----------	0.37			

TABLE 16.--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
35C2 Gorin	0-5	12-30	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Moderate	0.43	3	6	.5-1
	5-8	27-45	1.30-1.45	0.06-0.6	0.18-0.20	4.5-6.5	Moderate	0.32			
	8-32	35-60	1.30-1.40	0.06-0.2	0.11-0.16	4.5-6.0	High	0.32			
	32-42	27-40	1.30-1.45	0.2-0.6	0.18-0.20	4.5-7.3	Moderate	0.32			
	42-60	20-27	1.30-1.45	0.2-0.6	0.17-0.20	4.5-7.3	Moderate	0.37			
37B Marion	0-13	12-27	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	6	1-2
	13-27	48-60	1.30-1.65	<0.06	0.11-0.13	3.6-5.5	High	0.32			
	27-52	30-40	1.30-1.55	0.06-0.2	0.15-0.17	3.6-6.0	Moderate	0.43			
	52-60	24-35	1.35-1.45	0.2-0.6	0.15-0.18	5.1-6.5	Moderate	0.43			
39C2, 39E2 Keswick	0-7	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate	0.37	3	6	.5-1
	7-46	35-60	1.55-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High	0.37			
	46-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.8	Moderate	0.37			
41C2 Leonard	0-6	27-35	1.20-1.40	0.2-0.6	0.22-0.24	6.1-7.3	Moderate	0.37	3	7	1-2
	6-10	35-45	1.30-1.45	0.06-0.2	0.11-0.13	4.5-6.5	High	0.37			
	10-60	35-50	1.20-1.35	0.06-0.2	0.10-0.12	4.5-6.5	High	0.37			
43B Adco	0-8	15-30	1.20-1.40	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.32	3	6	2-4
	8-14	15-30	1.20-1.40	0.6-2.0	0.16-0.20	4.5-6.5	Low	0.32			
	14-33	50-60	1.20-1.40	<0.06	0.09-0.11	5.1-6.5	High	0.43			
	33-56	32-50	1.25-1.45	0.06-0.2	0.12-0.18	5.1-7.3	High	0.43			
	56-60	15-35	1.30-1.50	0.06-0.2	0.14-0.18	5.6-7.3	Moderate	0.43			
44 Belinda	0-8	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	3	6	2-3
	8-16	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.43			
	16-31	28-52	1.30-1.45	<0.06	0.12-0.14	4.5-6.5	High	0.32			
	31-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High	0.43			
45F Bucklick	0-10	15-25	1.35-1.45	0.6-2.0	0.15-0.24	4.5-7.3	Low	0.32	4	6	1-2
	10-31	35-45	1.25-1.35	0.6-2.0	0.10-0.18	4.5-7.3	High	0.32			
	31-46	35-45	1.25-1.55	0.6-2.0	0.08-0.18	5.1-7.3	High	0.32			
	46	---	---	0.01-0.06	---	---	---	---			
47C2 Winfield	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	6	.5-1
	8-20	22-30	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Moderate	0.37			
	20-44	27-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.37			
	44-70	20-27	1.30-1.50	0.6-2.0	0.20-0.22	5.1-6.5	Low	0.37			
48C Alvin	0-15	10-15	1.45-1.65	2.0-6.0	0.14-0.17	4.5-7.3	Low	0.24	5	3	<.5
	15-36	15-22	1.40-1.65	2.0-6.0	0.14-0.18	4.5-7.3	Low	0.24			
	36-60	3-10	1.45-1.65	2.0-6.0	0.10-0.15	5.1-8.4	Low	0.24			
49 Vesser	0-15	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.28	5	6	2-3
	15-24	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate	0.43			
	24-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.1-6.5	Moderate	0.43			
50. Pits											
51 Gilford	0-15	10-20	1.50-1.70	2.0-6.0	0.16-0.18	5.6-7.3	Low	0.20	4	3	2-4
	15-49	8-17	1.60-1.80	2.0-6.0	0.12-0.14	5.6-7.3	Low	0.20			
	49-60	2-12	1.70-1.90	6.0-20	0.05-0.08	6.6-8.4	Low	0.15			
53 Vesser	0-11	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.28	5	6	2-3
	11-31	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate	0.43			
	31-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.1-6.5	Moderate	0.43			

TABLE 16.--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
54---------------- Zook	0-9	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High---------	0.28	5	4	4-6
	9-49	35-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.3	High---------	0.28			
	49-60	25-45	1.30-1.45	0.06-0.2	0.11-0.20	5.6-7.3	High---------	0.28			
60---------------- Excello	0-14	27-35	1.40-1.50	0.6-2.0	0.17-0.19	6.1-7.3	Moderate-----	0.24	5	6	2-4
	14-41	18-35	1.40-1.55	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.28			
	41-60	18-35	1.50-1.60	0.6-2.0	0.14-0.19	6.1-7.3	Moderate-----	0.28			
66---------------- Nodaway	0-7	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.37	5	6	2-3
	7-60	18-32	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.43			
71---------------- Beaucoup	0-15	18-27	1.25-1.40	0.2-0.6	0.22-0.24	5.6-7.8	Low----------	0.32	5	6	2-4
	15-60	27-35	1.30-1.50	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.32			
74---------------- Orion	0-5	10-18	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.37	5	5	1-2
	5-32	10-18	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.37			
	32-60	10-30	1.25-1.45	0.6-2.0	0.18-0.22	5.6-7.8	Low----------	0.37			
82---------------- Lawson	0-10	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5	2-4
	10-28	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.28			
	28-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
90---------------- Perks	0-18	2-10	1.50-1.55	6.0-20	0.07-0.09	5.6-7.3	Low----------	0.17	5	2	<.5
	18-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15			
91---------------- Wiota	0-15	20-27	1.30-1.35	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.28	5	6	2-4
	15-60	30-36	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43			
99---------------- Fatima	0-13	15-27	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.28	5	6	2-4
	13-32	18-27	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.28			
	32-60	18-30	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.28			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "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			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
01---------------- Wakeland	C	Frequent----	Brief or long.	Nov-Jun	1.0-3.0	Apparent	Nov-Apr	>60	---	High-----	High-----	Low.
02---------------- Klum	B	Frequent----	Brief or long.	Nov-Jun	3.0-5.0	Apparent	Nov-May	>60	---	Moderate	Low------	Low.
08---------------- Huntsville	B	Occasional	Very brief or brief.	Nov-Jun	4.0-6.0	Apparent	Nov-May	>60	---	High-----	Low------	Low.
15B--------------- Hoopeston	B	None--------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	High-----	Low------	Moderate.
17C--------------- Neeper	B	Rare--------	---	---	4.0-6.0	Perched	Nov-Apr	>60	---	Moderate	Moderate	Moderate.
18B--------------- Jasper	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
19A, 19C---------- Plainfield	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
20---------------- Colo	B	Occasional	Very brief or long.	Nov-May	1.0-3.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Moderate.
24---------------- Moniteau	C	Rare--------	---	---	0-1.0	Apparent	Nov-May	>60	---	High-----	High-----	High.
26C2-------------- Weller	C	None--------	---	---	2.0-4.0	Perched	Nov-Apr	>60	---	High-----	High-----	High.
27---------------- Zook	C	Occasional	Brief-----	Nov-May	0.-2.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
29F--------------- Lindley	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
31C2, 31E2-------- Armstrong	C	None--------	---	---	1.0-3.0	Perched	Nov-Apr	>60	---	High-----	High-----	Moderate.
32F2-------------- Gara	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
33---------------- Edina	D	None--------	---	---	0-1.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
35C2 Gorin	C	None	---	---	1.5-2.5	Perched	Nov-Apr	>60	---	High	High	Moderate.
37B Marion	D	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High	High.
39C2, 39E2 Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Apr	>60	---	High	High	Moderate.
41C2 Leonard	D	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	High	High	Moderate.
43B Adco	D	None	---	---	1.0-2.5	Perched	Nov-May	>60	---	High	High	Moderate.
44 Belinda	D	None	---	---	0.5-2.0	Apparent	Nov-May	>60	---	Moderate	High	Moderate.
45F Bucklick	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate	Moderate.
47C2 Winfield	B	None	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	High	Moderate	Moderate.
48C Alvin	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
49 Vesser	C	Occasional	Brief	Nov-May	0-1.5	Apparent	Nov-May	>60	---	High	High	Moderate.
50. Pits												
51 Gilford	B/D	Occasional	Brief	Nov-Jun	+.5-1.0	Apparent	Nov-May	>60	---	High	High	Moderate.
53 Vesser	C	Frequent	Brief	Nov-Jun	0-1.5	Apparent	Nov-May	>60	---	High	High	Moderate.
54 Zook	C	Frequent	Brief	Nov-Jun	0.-2.0	Apparent	Nov-May	>60	---	High	High	Moderate.
60 Excello	B/D	Occasional	Brief	Nov-Jun	0-1.5	Apparent	Nov-May	>60	---	High	High	Low.
66 Nodaway	B	Occasional	Very brief or brief.	Nov-Jun	3.0-5.0	Apparent	Nov-May	>60	---	High	Moderate	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
71---------------- Beaucoup	B/D	Occasional	Brief-----	Mar-Jun	0-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
74---------------- Orion	C	Occasional	Very brief or brief.	Nov-Jun	1.0-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
82---------------- Lawson	C	Occasional	Brief-----	Nov-May	1.0-3.0	Apparent	Nov-May	>60	---	High-----	Moderate	Low.
90---------------- Perks	A	Occasional	Very brief or brief.	Nov-May	>6.0	---	---	>60	---	Low------	Low------	Moderate.
91---------------- Wiota	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
99---------------- Fatima	B	Frequent----	Brief or long.	Nov-Jun	2.0-3.5	Apparent	Nov-Apr	>60	---	High-----	Moderate	Low.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adco	Fine, montmorillonitic, mesic Vertic Albaqualfs
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Armstrong	Fine, montmorillonitic, mesic Aquertic Hapludalfs
Beaucoup	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Belinda	Fine, montmorillonitic, mesic Vertic Albaqualfs
Bucklick	Fine, mixed, mesic Typic Hapludalfs
Colo	Fine-silty, mixed, mesic Cumulic Endoaquolls
Edina	Fine, montmorillonitic, mesic Vertic Argialbolls
Excello	Fine-loamy, mixed, mesic Cumulic Endoaquolls
Fatima	Fine-silty, mixed, mesic Fluvaquentic Hapludolls
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Gilford	Coarse-loamy, mixed, mesic Typic Endoaquolls
Gorin	Fine, montmorillonitic, mesic Aquertic Hapludalfs
Hoopeston	Coarse-loamy, mixed, mesic Aquic Hapludolls
Huntsville	Fine-silty, mixed, mesic Cumulic Hapludolls
Jasper	Fine-loamy, mixed, mesic Typic Argiudolls
Keswick	Fine, montmorillonitic, mesic Aquertic Hapludalfs
Klum	Coarse-loamy, mixed, nonacid, mesic Mollic Udifluvents
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Leonard	Fine, montmorillonitic, mesic Vertic Epiaqualfs
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Marion	Fine, montmorillonitic, mesic Aquertic Hapludalfs
Moniteau	Fine-silty, mixed, mesic Typic Endoaqualfs
Neeper	Fine-loamy, mixed, mesic Typic Hapludolls
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Orion	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Perks	Mixed, mesic Typic Udipsamments
Plainfield	Mixed, mesic Typic Udipsamments
Vesser	Fine-silty, mixed, mesic Argiaquic Argialbolls
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Weller	Fine, montmorillonitic, mesic Aquertic Hapludalfs
Winfield	Fine-silty, mixed, mesic Oxyaquic Hapludalfs
Wiota	Fine-silty, mixed, mesic Typic Argiudolls
Zook	Fine, montmorillonitic, mesic Vertic Endoaquolls

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